



UNIVERSITY OF AGDER

EXAMINING THE ENVIRONMENTAL PERFORMANCE OF FIRST TIER SUPPLIERS IN THE OIL AND GAS SUPPLY CHAIN INDUSTRY

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This Master's Thesis is carried out as a part of the education at the University of Agder and is therefore approved as a part of this education. However, this does not imply that the University answers for the methods that are used or the conclusions that are drawn.

University of Agder, 2012

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ABSTRACT

The increasing interest in environmental sustainability and supply chain performance is creating a pressure on firms to pay more attention to their environmental footprints. This pressure is felt more in high polluting industries; therefore, these companies tend to pass these pressures to their suppliers. Thus, environmental performance of supply chains has become an extension of the individual firms' performance and a reflection of their environmental commitment to the natural environment.

The objective of this Master Thesis is to examine the environmental performance of upstream companies in the oil and gas supply chain. Using the Uppsala model and the resource-based view (RBV) of the firm as a theoretical foundation, the firm resources and capabilities, its environmental commitment, and the degree of environmental collaboration are identified as three potential drivers for environmental performance. The interaction between environmental commitment and environmental performance is influenced by the environmental regulations that act as a moderator for compelling environmental behavior, and the need for incentives as a motivator for self-regulating. The study is exploratory in nature and based on interviews and online survey with six companies in the offshore oil and gas industry. The aim is to examine the path process between the variables and their implication on environmental performance.

The findings reveal that a proactive environmental commitment has a direct influence on setting goals and priorities manifested in the firm's actions. Green purchasing activities, to include selecting, evaluating, and monitoring suppliers are central in communicating an environmental commitment and conducting a better environmental behavior in the supply chain. The findings also show that commitment acts as a driving mechanism for environmental collaboration and investment decisions to develop appropriate environmental resources and capabilities. The valuable resources and capabilities of the firm are found to have specific advantage in capturing opportunities, creating sustainable products, and responding to customers' environmental requirements. Environmental collaboration is found to be task specific and emphasizes more collaboration with customers than with the supplier. In addition, it is regarded as inhabited with relational risks, therefore, it is only exercised to the extent it does not compromise competitiveness.

The findings also show that environmental regulations are perceived complicated and lacking guidance in the design and use of environmental indicators. They are also seen as open for broad interpretation and inefficient in resolving issues of environmental responsibilities. The difference in the interpretation and application of environmental standards across countries challenges the competitiveness of companies when competing in more relaxed regions. In addition, the findings show that environmental commitment is focused on the business areas and on locations that are subject to stronger control. Therefore, the findings imply that regulations would yield better results if they are applied with tighter control.

The introduction of an incentive approach is seen as a positive motivator to reinforce environmental commitment. Incentives help companies preserve their competitiveness in the international market without compromising their sustainable performance. Supplier's incentives are useful in fostering a deeper commitment to a proactive environmental performance. However, the findings reveal that companies are not interested in committing efforts to the suppliers' development programs. Based on these findings, the study discusses some implications regarding green purchasing decisions and activities; in addition to implication concerning environmental regulations and controls. The study also highlights limitations encountered and postulate recommendation for future research.

Acknowledgement

As I put my last touches on this work, I am thinking back at those moments when I thought this research was never going to finish in time. This may have been true without the support of several persons to whom I feel indebted.

First, I would like to extend my deepest appreciation to my supervisor Gøril Hannås for her valuable feedback, support, and constructive criticism. Without her close follow up, guidance, and encouragement it would not have been possible to deliver this project on time. I would also like to thank her for introducing me to the NODE project, which has marked the starting point for my research.

I also want to extend my deepest gratitude to Professor Otto Andersen for his guidance in the methodological procedures on the quantitative approach applied in this study. And special thanks for Henry Langseth, for his IT support and for rescuing my research when the survey database crashed.

Secondly, my deepest appreciation to the NODE coordinator, Mr. Sven Haagenen for his valuable time to proof read some of my drafts and for his feedback and inputs. I would also like to thank NODE secretariat for their support in contacting the companies.

Thirdly, for the staff and managers in the companies interviewed, I would like to thank you for availing me your precious time and agreeing to conduct the interviews using the English language. I also want to express my gratitude to those that took the time to entertain my follow-ups when needed.

Lastly, I am greatly indebted for my family for their support during my two years study. In particular, I owe my deepest gratitude to my son Zein for his patience and comforting words.

Jocelyne B. Tynon

University of Agder (Uia)

Spring, 2012

Dedication

This work is dedicated to:

To my mother

Thank you for all the sacrifices you made and for believing in me

&

To my 'little angel' son Zein-Henry

Your love, patience and understanding made it easy to continue

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List of Abbreviations

ECIs:	Environmental condition indicators
EPIs:	Environmental performance indicators
GSCM:	Green supply chain management
GSCMS:	Green supply chain management systems
HSE:	Health, safety, and environment
ISO:	International Standards Organization
MNCs:	Multinational corporations
MPIs:	Management performance indicators
NODE:	Norwegian Offshore and Drilling Engineering
NOx:	The Nitrogen Oxides Fund
OPIs:	Operational performance indicators
TBL:	The triple bottom
TEQM:	Total environmental quality management
TQM:	Total quality management
TRI:	Toxics release inventory
QHSE:	Quality, health, safety, and environment
RBV:	Resource-Based View

CHAPTER ONE

STUDY SETTING AND PROBLEM DEFINITION

Introduction

Over the past few decades, environmental sustainability in business practices has gained considerable attention. The extensive environmental footprint through the supply chain resulted in tremendous internal and external pressures on firms, from national and international environmental legislations, customers' demands, markets, public opinion, pressure groups, and media to perform in an environmentally sustainable manner. This environmental responsibility has an echo effect throughout the supply chain, whereby suppliers and sub-contractors are now expected to address environmental issues. Consequently, measuring and disclosing environmental performance is becoming an important strategic tool for firms in addressing environmental issues, realizing environmental visibility in the market, and in the allocation of their resources (Henry & Journeault, 2008).

1.1. Background of the study

Research has acknowledged the potential benefits of adopting environmental management systems and engaging in environmental practices, as a mean for sustainable supply chain. (Carter & Rogers, 2008; Handfield et al., 2008). However, tracking the environmental performance of suppliers, especially beyond the first-tier is a challenging endeavor. Sarkis et al. (2005) attributes this to geographical, cultural, legal jurisdiction and regulatory differences. This is made more difficult by the lack of agreed upon metrics, the unavailability of standardized data and poor understanding of inter-organizational performance measurement (Rothenberg et al., 2005).

The adoption of environmental management depends on the level of environmental commitment denoted in the practices of firms and how they prioritize environmental issues (Tomer & Sadler, 2007). Such environmental commitment would also be reflected in their purchasing strategy and in the manner they select and collaborate with their suppliers. Exploratory studies conducted with first-tier auto parts suppliers revealed that firms are

interested in discussing and monitoring their suppliers' environmental performance only in the event it represented a risk to the production system, if it was a critical purchasing factor, and if it was well documented, resourced and standardized aspect of their Purchasing role (Simpson & Power, 2005).

Companies seek certification and engage in reporting as a matter of compliance and as a proxy for legitimization and not for genuine accountability (Adams, 2004; Bansal & Clelland, 2004). This has raised questions over the reliability and the validity of certification and reporting as valid and sufficient criteria for assessing suppliers' environmental performance (Poksinska et al., 2003; Henri & Journeault, 2008; Lee et al., 2009). This lead us to wonder whether the environmental regulations are efficient enough in resolving issues of environmental responsibilities and setting guiding environmental measures.

1.2. Study problem definition

Literature shows that the adoption of various environmental practices usually leads to better environmental performance (Zhu & Sarkis, 2004; Claver et al., 2007; Testa & Iraldo, 2010). Environmental performance can also be evaluated through green purchasing activities and the integration of environmental criteria into the supplier selection and monitoring process (Handfield, et al., 2005). Using environmental indicators constitute a fundamental dimension in the supplier selection process. The problem is that environmental regulations do not provide clear guidance in the design and use of environmental indicators, nor do they resolve the issue of environmental responsibility (Comoglio & Botta, 2012). In addition, measuring environmental performance in a supply chain that is regionally or globally dispersed is challenging (Sarkis et al., 2005). Certification is often used as a generic measure; therefore, it cannot be constituted as a definitive proof for environmental performance. Hence, the need for environmental performance indicators that are reflective of the industry specific issues. Practical indicators can be realistically measured and implemented; thus, they can be communicated through verifiable disclosures (Sarkis et al., 2005).

Environmental performance can also be measured by the level of collaboration with customers and suppliers and by the quality of their interdependencies. Powerful customers have the ability to influence more responsible environmental behavior (Vachon & Klassen, 2006; Simpson et al., 2007). However, when the relational risk is high, collaboration tend to

be task specific, which undermines the objective of greening the supply chain (Cheng et al., 2008).

The complexity of the rules makes it difficult for companies to go beyond compliance. The difference in the regulation requirements and implementation create challenge for companies to compete. This difference has its implication on the environmental performance and competitiveness of the firm operating in countries with tighter control (Iraldo et al., 2011). Therefore, an incentive-based approach would be a strong motivator to sustainable performance (Pagell & Wu, 2009). An incentive system is also good motivator for collaborative ventures and help in coercing suppliers' environmental behavior. It is therefore the intention of this thesis to examine the effect of the interrelations of commitment, collaboration, resources and capabilities on environmental performance and the role of environmental regulations and incentives in improving the environmental behaviors in the supply chain.

1.3. Research objectives and questions

The main objective of this research is to investigate the environmental practices of the first tier upstream suppliers in the oil and gas industry and see to what extent the interrelations of commitment, collaboration, resources and capabilities shape the outcome of environmental performance. In addition, the study intends to examine the moderating effect of environmental regulations and incentives on environmental commitment. In the process, specific attention is given to performance indicators, their limitations, and what indicators companies perceive valuable and measurable.

Consistent with the aforementioned objectives, this study is based on the following questions:

- How does resources and capabilities affect the firm environmental performance?
- What is the extent of environmental collaboration and how does it affect environmental performance?
- Are environmental regulations effective enough to induce performance beyond compliance?
- How can incentives influence higher commitment and better environmental behavior?

1.4. Contribution of the study

The study provides an insight on environmental practices and their implications on the environmental performance of first tier upstream suppliers. It also examines their efforts in greening their supply chain. The study also reaffirm the theoretical link of environmental commitment as the mechanism for environmental performance. In addition, the study examine the supplier assessment and selection process and propose a set of environmental indicators as environmental selection criteria. Finally, the findings may have some implications for those concerned with environmental regulations and control.

1.5. Organization of the thesis

This thesis is organized into five chapters; consisting of chapter two representing a literature review and empirical evidence on the variables used in the study and development of the propositions. Chapter three presents the research methods and how the data was collected and analyzed. Chapter four provide representation of finding and data gathered during the study. Chapter five represents a discussing of the finding and presentation of the conclusion and recommendation.

CHAPTER TWO

THEORETICAL FRAMEWORK AND PROPOSITIONS FORMULATION

Introduction

This chapter provides both the theoretical and empirical work available in the area of environmental performance. The Uppsala model and the resource-based view (RBV) were used as foundation for empirical arguments. The Uppsala model underlines the importance of commitment in decision-making and implementation. It also stresses the importance of customer-supplier collaboration, and recognizes the feasibility of exercising power to influence behavior. The RBV advocates the importance of resources and capabilities as key enablers for better environmental performance. When measuring for organizational performance, the triple bottom line (TBL) theory is used. The chapter also presents tentative propositions that relates to constructs applied in the course of studying the phenomenon.

The Uppsala Model

The Uppsala model highlights the importance of commitment in decisions making and subsequent activities undertaken. Commitment determines how and why actors, resources and activities are linked and helps explain the purpose and outcomes of this interaction (Lenney & Easton, 2009). The model also stresses the significance of customers-suppliers interactions and lasting relations in accumulating knowledge, building trust and greater commitment (Johanson & Vahlne, 2009). In addition, the Uppsala model recognizes the value of opportunity created through ongoing activities and accumulated experience knowledge. Thus, strong commitments to partners provide access to knowledge, resources and capability, create opportunities, and consequently lead to a favorable position in the market (Johanson & Vahlne, 2009).

Resource-Based View (RBV)

The RBV offers an additional perspective that strengthens the Uppsala logic and it has been often used as a valuable theory in analyzing the supply chain strategies. The RBV argues that through a set of valuable, rare, non-sustainable and imperfectly imitable resources and capabilities, firms can achieve competitive advantage. Thus, the resources heterogeneity explains why some firms consistently outperform other firms (Barney, 2001). Distinction made between resources and capabilities, whereby resources are defined as stock of available factors such as physical and financial assets, firm attributes, skills, and knowledge that are owned or controlled by the firm. Capabilities are defined as the firm processes that perform particular value-added tasks or activities and its capacity to deploy resources (Chen et al., 2009; Sarkis et al., 2011; Dao, et al., 2011).

Owing to the dynamic changes in the business environment and market demands, the dynamic capabilities allow a firm to reconfigure, integrate, and transfer internal and external competencies to address rapidly changing environments (Wang & Ahmed, 2007). In particular, dynamic capabilities related to knowledge-based, product development and alliances can create a sustainable competitive advantage; thus, permitting a firm to generate value-creating strategies (Eisenhardt & Martin, 2000). The value of these resources and capabilities is defined in terms of their effect on environmental performance. Common features of dynamic capabilities exhibited across firms are often idiosyncratic in their specifics. This is attributed to the effect of best practices shared within and across industries through alliances, cross-functional teams and explicit linkage to outside resources (Eisenhardt & Martin, 2000). As such, dynamic capabilities can be the result of path-dependence idiosyncratic learning process (Wang & Ahmed, 2007).

Firms do not exist independent of their natural environment; therefore, competitive advantage can be rooted in resources and capabilities that can facilitate environmentally friendly activities. Finding innovative solutions to environmental challenges through improving processes, building synergetic capabilities, and developing prevention technologies can improve cost, delivery, quality, and flexibility (Vachon & Klassen, 2008; Hart & Dowell, 2011). Achieving product stewardship requires an understanding of the interdependency between the product life cycle and integrating capabilities (Matos & Hall, 2007; Hart &

Dowell, 2011). Therefore, investment decisions are considered an extension of a firm's environmental commitment to the social environment.

The Triple Bottom Line

The Triple bottom Line (TBL) theory emerged as a tool for measuring organizational performance. In addition to the financial aspect, it also incorporates environmental and social goals and suggests that the intersecting activities of the three dimensions will positively affect the natural environment, as well as resulting in long-term economic benefits (Carter & Rogers, 2008).

Firms engage in sustainable activities as a way to assert their legitimacy, increase market value, and retain the support of influential stakeholders (Bansal & Clelland, 2004). Sustainability helps firms improve operations, innovation, and strategic growth while providing sustainable values to the broader environment and society (Dao et al., 2011). Sikdar (2003:1928) and (Go'ncz et al., 2007:4) view organizational sustainability as "a wise balance" ... "equally weightings for economic stability, ecological compatibility and social equilibrium." Sustainability also includes a risk management aspect translated by Carter & Rogers (2008: 366) as the "ability of a firm to understand and manage its economic, environmental, and social risks in the supply chain." Further, sustainability can be substantiated through transparency reporting and active engagement in green activities that can improve the environmental performance of the supply chain (Carter & Rogers, 2008).

However, the TBL concept is often criticized because of its narrow accounting focus (Vanclay, 2004). While it is easy to measure the financial performance, the environmental and social performances are more industry and organization specific and are often difficult to quantify (Hubbard, 2009). Some firms apply internationally recognized environmental management systems such as the ISO 14001 to measure their suppliers' environmental impact, as well as measure and monitor their own performance against set targets and objectives. Environmental management systems are also applied as a way to meet reporting requirements for compliance and transparency (Hubbard, 2009). However, measuring the social impact of the environmental performance remain challenging due to absence of generally stipulated and accepted social standard management system. Consequently, a corporate citizenship is currently measured through a variety of social actions such as

donations, sponsorships, community outreach, and by using sourcing and vendors' standards (Hubbard, 2009).

Environmental Management

Growing environmental pressures mandated the integration of environmental management into businesses activities. Environmental management practices are paramount for an improved environmental performance. However, Zhu et al. (2008) note that environmental management practices are not uniform and they differ in context across industries. Environmental management addresses the influence and relationships between firms' actions and the natural environment. It involves commitment to environmental issues that is expressed in setting goals and priorities Zsidisin and Siferd (2001). It also involves integrating environmental criteria into purchasing decisions and suppliers selection (Diabat & Govindan, 2011), auditing and monitoring activities (Zhu & Sarkis, 2004) and Henri & Journeault, 2008) considering the natural environment in design, material sourcing production, distribution, use, re-use and disposal of the product (Srivasta, 2007). Proactive environmental management can also capture some value from collaborative interaction with suppliers and customers to reduce the environmental impact and improve the environmental quality, flexibility and responsiveness (Zhu & Sarkis, 2004). Further arguments support the notion that advanced environmental management practices create a productive interaction between suppliers and customers, thus leading to a network of information and knowledge sharing. It also helps in generating operational capabilities, increase stakeholders' integration and improve environmental performance (Vachon et al., 2008). Consequently, environmental management stimulates efficiency and synergy that includes enhancing the environmental performance, improving competitive advantage and reducing cost (Rao & Holt, 2005).

Environmental performance

Environmental performance is the ecological outcome of an organization commitment, environmental practices, and activities for the purpose of minimizing its impact on the natural environment (Judge & Elenkov, 2004; Lopez-Gamero et al., 2009). Hubbard (2009) explains environmental performance by the amount of resources used in operations such as energy, water, land, and the byproducts generated by the firm's activities such as waste, air emission, spillages, and pollution.

Literature for environmental management shows that the adoption of various environmental practices usually leads to better environmental performance and support the competitive advantage of a firm (Zhu & Sarkis, 2004; Claver et al., 2007; Testa & Iraldo, 2010). The focus of management on environmental issues can be measured through the efficient use of resources, waste management and recycling. It can also be measured by the pollution outputs of the production processes, through periodic environmental audits, and environmental trainings programs, and through the application of total environmental quality management (TEQM) programs (Henri & Journeault, 2008; López-Gamero, et al., 2009). Environmental performance can also be evaluated through green purchasing activities and the integration of environmental criteria into the supplier selection process (Handfield et al., 2002). Additionally, green purchasing decisions extend to choosing environmentally friendly raw material, product design, substitution, reduction, extension of product life cycle, and final deposition (Handfield, et al., 2005). The implementation of environmental practices can create environmental benefits (Mollenkopf et al., 2010). Those benefits are seen to relate to corporate image, market opportunities, reducing compliance cost, and improved quality (Sarkis, Hervani et al., 2005; Molina-Azorin et al., 2009; Testa & Iraldo, 2010).

Environmental performance can also be measured by the level of collaboration with customers and suppliers and the extent of monitoring and auditing the supplier environmental performance process (Vachon & Klassen, 2006). In addition, environmental performance can be influenced through power asymmetry; as such, the customer as a major stakeholder has the power to influence the commitment, practices, and outcomes of their suppliers. (Geffen & Rothenberg, 2000) found that the most effective partnerships were based on contractual arrangements that included consideration of environmental goals and encouraged broader sharing of innovative products and ideas across more elements of the production system.

Studies point out that high pollution industries with high environmental sensitivity, such as the oil and gas industry, are more likely to pursue an extensive environmental performance and disclosure (Patten, 2002; Lopez-Gamero et al., 2010). Environmental disclosures provide evidence of transparency and traceability and they are regarded as endorsement of the firm's commitment made through a record of environmental actions and accomplishments (Tomer & Sadler, 2007; Pagell & Wu, 2009).

2.5.1. Environmental performance measures and indicators

Performance measures are essential tools for tracking progress against the firm strategy, determining the efficiency and effectiveness of existing systems, and identifying areas for improvement (Shaw, et al., 2010). They are also helpful for comparing competing alternative systems, and act as a good benchmark against competitors (Hervani et al., 2005). They are also useful for the purpose of external reporting and they are driven by the creation, maximization and defense of economic rents that are derived from unique capabilities such as reputation, strategic assets, innovations, and distinctive relationships with customers and suppliers (Hervani et al., 2005).

Environmental performance indicators (EPIs) are defined by ISO 14031 as “a specific expression that provides information about an organization’s environmental performance” (Shaw, et al., 2010: 326). They are useful tool when evaluating the environmental performance of activities, processes, hardware and services. They can stimulate the necessary behavior for compliance because as they can hold firm accountable for achieving certain level of environmental performance against a set of chosen indicators (Hervani et al., 2005). EPIs are divided into three classifications representing: Management performance indicators (MPIs) reflecting management environmental efforts, Operational performance indicators (OPIs) provide information about production activities, and Environmental condition indicators (ECIs) which measure the impact of a firm’s activities on the local environment (Shaw, et al., 2010). EPIs are considered as a motivating tool for stimulating the desire to improve performance, standards and processes by finding environmental costs saving and compliance solutions (Hervani et al. 2005).

Environmental benchmarking depends on the environmental management systems put in place. However, many firms are straggling with how to measure their internal environmental performance, let alone, that of their suppliers. Consequently, a number of firms are not in a position to conduct benchmarking activities (Shaw, et al., 2010). In order to benchmark internal performance in the firm, it is essential that EPIs are directly related to the firm environmental objectives and targets. Hervani et al. (2005) argue that environmental performance measures systems are considered organization specific. Authors also regard them as dynamic in nature and exist at multiple levels of product and processes. Thus, their reliability is based on their effective internal and external communication, clear assignment of

accountability for results, and the extent they are linked to compensation, rewards, and recognition systems (Sarkis et al., 2005).

There are different challenges associated with environmental performance measures. One key challenge for firms is selecting the appropriate and effective indicators to measure the environmental performance (Shaw, et al., 2010). Zhu and Sarkis, (2006) note that companies in different industries have different drivers and barriers that influence a firm environmental performance. Consequently, it is reasonable to assume that environmental measures are also different from one industry to another. Another challenge is to find the appropriate measures that are comparable, robust, credible, valid and reliable, which can be applicable across all industries, and may be safely disclosed (Shaw, et al., 2010). Moreover, environmental measurements are often associated with too many metrics that are not even aligned to the firm's strategy, to the extends that it becomes difficult, costly and time consuming for firms to benchmark their environmental performance both internally and externally and produce meaningful reporting (Hoffman, 2006).

Environmental commitment

The Uppsala model states that commitment and market knowledge affect the perceived opportunities and risks (Johanson & Vahle, 2009). Menguc & Ozanne (2005) regard commitment as a form to satisfy a need for legitimacy. In both cases, commitment affects the environmental decisions and activities of a firm and consequently its environmental performance.

2.6.1. Drivers and barriers for environmental commitment

A number of drivers affect the environmental commitment of firms to pursue green practices. Those drivers are divided into internal and external drivers. Internal drivers stem out of the firm environmental culture, strategy and goals (Hansen et al., 2004) and the need to preserve the firm's environmental reputation and legitimacy (Hervani et al., 2005). The firm's green strategy capitalizes on the profitability potential gained from the emergence of environmentally responsive market segments (Mollenkopf et al., 2010). Therefore, firms that adopt environmental strategies and invest in green capabilities can gain competitive advantage

and raise the rivals cost by influencing future industry environmental standards (Clarkson et al., 2011). Firms are further motivated by the desire to reduce costs and improve quality (Walker et al., 2008; Mollenkopf et al., 2010).

External drivers include investors, public, and stakeholders' pressure explained by the degree of firms' environmental visibility (Walker et al., 2008). External pressures also include government regulations, environmental standards such as ISO-14001, and the cost associated with environmental risks (Zhu et al., 2007). Customers' demands, market pressure, and competitors as potential environmental technology leaders causes firms to respond to competitive conditions through innovations that stimulate environmental performance (Hervani et al., 2005; Walker et al., 2008).

However, as there are drivers that induce environmental commitment, there are also barriers. Those are experienced in the lack of understanding of the GSCM concept, lack of metrics and unavailability of data for measuring environmental performance across the supply chain (Zhu & Sarkis 2004). Another barrier is attributed to the risk and opportunity cost of losing key partners because buyers often focus on low cost (Mollenkopf et al., 2010). Other barriers are related to absence of strategic competencies, time and capacities, and the lack of environmental orientation (Hervani et al., 2005). However, costs and competitiveness concerns seems to be the most prevailing challenge that holds companies back from moving towards better environmental performance, especially in the absence of incentives, the limitation of green and financial resources (Pimenova, & van der Vrost, 2004; Walker et al., 2008).

Drivers for environmental commitment	
Internal drivers <ul style="list-style-type: none"> ▪ The firm environmental culture, strategy and goals. ▪ Need to preserve reputation and legitimacy ▪ Desire to reduce costs, enhances efficiency, and improve quality ▪ Need to capitalize on the profitability potential of new customer segment. ▪ Raise the rivals cost by influencing future industry environmental standards 	External pressures <ul style="list-style-type: none"> ▪ Investors, public, and stakeholders' pressures ▪ Government regulations, and environmental standards ▪ Environmental compliance ▪ Cost associated with environmental risks ▪ Customers' demands ▪ Business continuity ▪ Responsiveness to market expectations ▪ Competitors

Barriers for environmental commitment	
Internal barriers <ul style="list-style-type: none"> ▪ lack of understanding of the GSCM concept ▪ Wiliness to commit ▪ Absence of strategic competencies ▪ lack of environmental orientation and awareness, ▪ Time constraints ▪ Unavailability of sufficient resources (financial, technology, capacities) ▪ the lack of relationships with external stakeholders ▪ Unavailability of clear and guiding indicators and data for measuring environmental performance ▪ Risk and opportunity cost of losing key partners/supplier ▪ Cost and competitiveness 	External barriers <ul style="list-style-type: none"> ▪ Lack of supplier commitment ▪ Suppliers resistance ▪ Customer preference of reduced cost ▪ Lack of incentives

Table 2-1: Drivers and barriers affecting the firm environmental commitment

2.6.2. The interactions of the environmental commitment

Environmental commitment can be regarded as a resource that reflects the firm's goals, guide its activities, and provide a mechanism by which these activities are linked (Lenney & Easton, 2009). Environmental commitment can be measured by the extent of the firm environmental practices, the frequency of environmental audits and reviews, the value in its internal and external reporting, and through its competencies development programs and awards systems (Menguc & Ozanne, 2005). It can also be measured through its purchasing strategy, the selection and monitoring process of suppliers, and the extent of collaboration with customers and suppliers (Large & Thomsen, 2011).

The supplier selection process is challenged by the unavailability of clear and guiding environmental performance indicators. Thus firms rely on the environmental certification as criterion for the selection. Chen (2005) proposes that supplier selection should be based on two main criteria one of which is certification and the other one relates to general practices such as quality, delivery, and performance records. However, environmental certification is criticized as being generic and does not constitute a guaranty of a good environmental performance (Poksinska, et al., 2003; Henri & Journeault, 2008; Lee et al., 2009). On the other hand, Lee et al (2009) suggest that assessment of the supplier's environmental performance should be based on environmental categories that include green competencies, environmental efficiency, green image, and life cycle cost.

Firms that are committed to greening the supply chain process tend to assess and select suppliers that can demonstrate high level of environmental commitment and performance. Simpson, et al. (2007) found a positive relation between the customer's environmental performance and the supplier's environmental commitment. Therefore, environmental commitment leads to the development of green purchasing strategies, which enable the implementation of an environmental collaboration (Large & Thomsen, 2011). The authors also argue that highly committed companies develop environmental purchasing capabilities and implement supplier evaluation systems that help in monitoring the environmental performance of the supplier base.

Commitments require specific resources if they are to be fulfilled (Lenney & Easton, 2009), thus, they have a direct effect on investment decisions (Johanson & Vahle, 2003) and the development of green capabilities. Collaboration is a commitment extended beyond the firm's boundaries. Collaborative commitment provides a bridge into a world of opportunities, capacities, and new knowledge (Johanson & Vahle, 2006). Thus, a collaborative commitment implies a desire to continue with a relationship and the wiliness to invest in it (Johanson & Vahle, 2009). However, investing time and resources may not be an advantage afforded by all companies; therefore, certain collaborative commitments tend to be task specific. Consequently, commitments that are condition specific tend to have temporary environmental effect (Lenney & Easton, 2009).

It is realistic then to assume that an environmental commitment acts as a mechanism for environmental performance, as well, as interplay for environmental collaboration and the development of appropriate environmental resources and capabilities, thus the following proposition is made:

P₁: Environmental performance is positively associated with the level of environmental commitment.

Resources and capabilities

Drawing on the RBV, firms need to develop resources, skills, and capabilities that enable them to remain competitive in a dynamic green market (Menguc & Ozanne, 2005). Green

resources and capabilities are key contributing factors to a firm's environmental performance and can have a positive impact on the firm input costs, quality, and resources productivity (Judge & Elenkov, 2005). Consequently, the implementation of environmental management requires the development of the appropriate capabilities that can ease the introduction of pollution prevention programs and facilitate product stewardship (Hervani et al., 2005).

Green resources and capabilities can provide a firm with means to differentiate its products and services from their competitors and benefit from premium pricing and enhanced market share (Molina-Azorin, et al., 2009). In addition, Knowledge processes are also key enablers to environmental performance and the availability of the internal expertise can be an important resource for environmental innovations (Hervani et al., 2005). Consequently, a dynamic green approach of a firm is one that focuses on the firm's internal and external processes, how a firm deploys resources, and how it responds to dynamic markets environmental demands (Reuter et al., 2010). The pool of resources and capabilities can increase the firm technical capacities and allow it to move from compliance to value creation, which can raise productivity and enable growth (Diabat & Govindan, 2011).

As companies shift from simply controlling pollution at facility boundaries to fundamentally re-examining their products and processes to reduce the environmental impact at the source, they need to expand their experience base and competencies by drawing on outside resources, capabilities and expertise (Geffen & Rothenberg, 2000). These complementary resources are often achieved through alliances, collaboration or the acquisition of a complementary firm. Gonzalez-Benito, & Gonzalez-Benito (2005) found that the size of the company and availability of financial and human resources are substantial variables for stimulating higher interest in the implementation of ISO 14001. As such, the cost of compliance depends on the firm's resources and its ability to develop valuable environmental capabilities (Iraldo, et al., 2011). This is further supported by Chrismann (2000) who found that a firm's resources and capabilities can significantly influence the firm strategy, thereby creating a spillover effects. Consequently, the following proposition is made:

P₂: Environmental performance is positively associated with the level of resources & capabilities in the firm.

Environmental collaboration

Environmental collaboration implies cooperation to reduce the environmental impact associated with the supply chain processes and activities. Environmental collaboration is based on having similar interpretations of values, goals, and practices. Environmental collaboration is characterized by relational qualities, reciprocal information exchange, and dissemination of specialized market intelligence (Cheng, 2011). They have the capacity to overcome resource and capabilities constraints, development of critical mass for more effective competition, and mentoring (Vachon & Klassen, 2006; Arya & Lin, 2007). Thus encouraging sustainable green practices among customers and suppliers alike (Collins, et al., 2007).

Vachon & Klassen, 2008) found that environmental collaboration with primary suppliers is linked to process-based performance in the form of superior quality, flexibility performance, fast and reliable deliveries. The authors also argue that collaborative exchange with suppliers and customers can and help them find customized solutions to environmental challenges through product differentiation and innovation. In addition, environmental collaboration can help improve responsiveness through mitigating environmental risks, and continuous processes improvements. This can lead to improved environmental performance that goes beyond compliance and result in improved economic performance (López-Gamero et al., 2009). Consequently, effective coordination and collaboration of inter-organizational relationships can provide a firm with competitive advantage and flexibility to respond market demands, which can enhance its power and position in the supply chain (Eisenhardt & Martin, 2000).

The value of collaboration is in the inherent inter-organizational learning and the dissemination of environmental practices (Collins, et al., 2007). Collaboration can facilitate the transfer of knowledge capabilities. Therefore, the collaboration approach is increasingly used by firms as a tool to grow resources and capacities. Tacit knowledge acquired through strategic partnerships and collaboration are critical resources, as they enable a firm to command privileged that lead to value creation and enhance performance (Johanson & Vahlne, 2009; Johanson & Kao, 2010). Suppliers tend to be connected with a number of important customers within related industries, which can indirectly provide a greater access to

external information and experience with different technologies leading to real and measurable improvement in environmental performance (Geffen & Rothenberg, 2000).

However, close collaboration might entail direct involvement in the supplier's activities, which imply high transaction costs and risks for the buyer (Simpson & Power, 2005). The environmental commitment to suppliers bears strong relationship to the environmental requirement of its major customer (Cheng, 2011). This is due to the customer's inherent power. Therefore, the presence of specific relationship requirement such as the introduction of environmental requirements into supply contracts can have a direct influence on the environmental performance of suppliers (Simpson et al., 2007).

The general perception is that organizations will consider environmental issues only when it becomes relevant to the welfare and performance of the organization (Simpson et al., 2007). Subsequently, the dependence in the supply chain is measured by the importance of the customer to the supplier's order book and the importance of the supplier's purchased material, and the degree of power and influence each party has (Croom et al., 2000). Collaboration facilitates close interaction and collaboration between customer and suppliers and ensures an adaptive behavior for a more rapid diffusion of environmental practices, thus, the following proposition is made:

P₃: Environmental performance improves by the degree of environmental collaboration.

Environmental regulations

Environmental regulations are viewed as main driver for environmental compliance and a serious motivator for environmental commitment. The implementation of ISO 14001 is seen to be related to the outcome of an organization's environmental commitment, compliance with regulations, and the potential implication this have on the business and stakeholders reactions (Gonzalez-Benito, & Gonzalez-Benito, 2005). Mandatory regulations compel firms to address environmental challenges by adapting their technologies, operations, and processes in accordance to regulatory standard requirements (Camisón, 2010). Environmental regulations are also viewed as facilitators of environmental activities between the customer and the supplier (Nawrocka, et al., 2009). Therefore, proactive and committed companies address regulatory compliance through innovations, advance environmental practices, and a collaboration approach.

ISO 14001

Many companies seek ISO certification as a way to distinguish them from their competitors and in response to different types of internal and external pressures. Internal pressures arising from the need to achieve operational competitiveness, increase efficiency, and reduce costs associated with waste management, energy and material consumptions (Poksinka et al., 2002). It is also a response to enhance corporate image, improve customer-supplier relationships, and increase market competitiveness (Gonzalez-Benito, & Gonzalez-Benito, 2005). On the other hand, external pressures such as trade restrictions and the growing regulatory pressure drives many companies to channel the compliance requirements to their supply chain by necessitating that suppliers implement ISO 14001 and by articulating the requirements in contractual specifications (Handfield, et al., 2005 and Nawrocka et al., 2009). Some companies also believe that ISO 14001 certification can positively improve market position and reinforce credibility with regulatory bodies, governments, banks, insurance companies, media, and communities (Gonzalez-Benito, & Gonzalez-Benito, 2005). Therefore, ISO 14001 certification has become a useful marketing tool with no real value as a management tool for environmental performance (Pokinska et al., 2003).

Though ISO 14001 is argued to improve control of human behavior (Gonzalez-Benito, & Gonzalez-Benito, 2005), it is not designed as a performance standard for certification (Shaw, et al., 2010). ISO 14001 has been criticized as lacking clear guidelines for the design and use of environmental indicators (Comoglio & Botta, 2012). Further, it has been criticized for lacking a requirement for public reporting and wrongly signaling an environmentally friendly performance. Although, firms may be certified under ISO 14001, they do not necessarily seek successful implementation of best environmental practices (Sarkis et al., 2011). Thus, certification is a mean of legitimization only that results in a decoupling between superficial adoption and genuine implementation, referred to as the “Green washing” strategies (Sarkis et al., 2011). Another issue is that ISO 14001 does not require companies to achieve minimum levels of environmental performance (Comoglio & Botta, 2012). Thus, it cannot be regarded as a performance guarantee, or a reliable instrument for environmental performance improvement (Pokinska et al., 2003). Further, environmental regulations, policy and directions are different from one country to another. This difference has its implication on the environmental performance and competitiveness of the firm (Iraldo et al., 2011). Firms complying with regulations face higher production costs and reduced competitiveness, in particular, those who are competing against firms operating under relaxed environmental

regulations. Therefore, if regulations are uniformed across countries, compliance would be more a competing advantage (Iraldo, et al., 2011). To maintain competitive advantage, certified companies would be more inclined to undergo environmental transformations if public policies are based on incentives and the progressive achievement of objectives (Gonzalez-Benito, & Gonzalez-Benito, 2005).

Environmental Reporting

Regulatory requirements in many countries mandate firms to provide data related to their toxics release inventory (TRI) and environmental foot prints activities such as water usage, waste, and electrical consumption, among others. The aim of the reporting is to monitor the environmental performance of firms and provide customers and other stakeholders with broader view of the long-term performance improvements goals to reduce risks associated with environmental compliance and disclosure penalties (Hervani et al., 2005). The level and nature of environmental disclosures are also useful for investors who include environmental considerations in their investment decisions and they are relevant to regulators as they provide impetus for enhanced standards in a voluntary reporting environment (Clarkson et al., 2011). However, empirical evidence regarding the liability of information provided in these reports is mixed (Carter et al., 2008). Environmental disclosures remain mostly voluntary despite the requirement to report, thus firms exercise discretion regarding what should be reported and how (Clarkson et al., 2011). Consequently, this results in the disclosure of minimal information that would be of little value and have marginal use to stakeholders (Clarkson et al., 2011).

Environmental regulations acting as drivers or barriers have a moderating effect on the firm environmental commitment and performance outcomes. Consequently, the following proposition is put forward:

P₄: Environmental regulations positively influence the relation between environmental commitment and environmental performance.

Incentives

The agency theory argues that agents often behave in ways that benefit them (Sarkis, et al, 2011). Kogg (2003) argues that greening the supply chain can be achieved using power leverage and incentives. However, green supply chain requires the participations of various stakeholders, represented as customers, suppliers, competitors, financial institutes, industrial associations, ecologist organizations, investors, communities, regulatory bodies, and the government. The interdependency and interactions of these actors can adversely affect the environmental performance in the supply chain. Greater integration creates a path dependence and influence the behavior. Such dependency is based on the coloration of objectives and expected returns (Pierson, 2000). Incentives and reward systems focus on motivating increased performance, thus, they are linked to cybernetic controls (Malmi & Brown, 2008). Therefore, the greater the integration, the stronger the impact of the lock in effect is on green implementation and adaptive expectations (Sarkis et al., 2011).

Empirical evidence show that innovative designs of products and processes are linked to improved environmental performance (Pagell & Wu, 2009). Thus, firms that have the ability to innovate will be able to accrue such performance benefits. However, evidence demonstrates that companies are inclined to actively consider higher environmental performance due to the absence of incentive structures (Handfield, et al., 2001). Environmental regulations do not provide companies with incentives to go beyond legislative compliance (Jaffe, et al., 2002). Therefore, greater integration of stakeholders can play an important role in supporting the development and adoption of green values through increased use of market mechanisms, tax incentives, and subsidies as this will help companies to operate in a more competitive and sustainable manner.

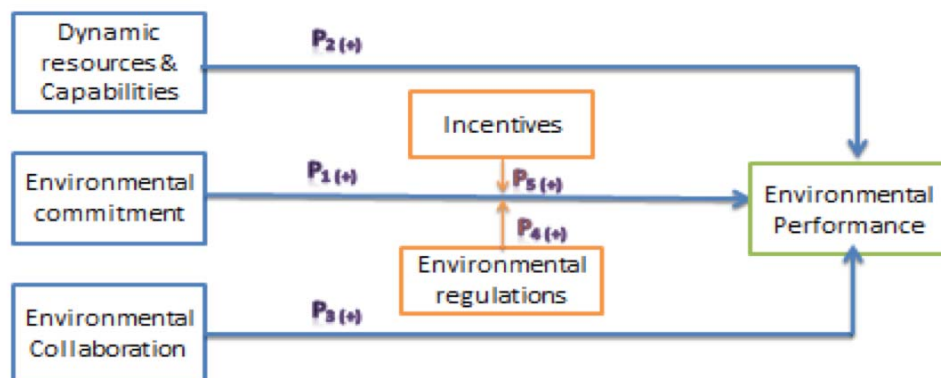
In addition, highly committed companies would create reward systems that link wanted behavior to outcomes values; as such, incentives would motivate employees and suppliers to pursue sustainable goals (Pagell & Wu, 2009). Incentives can also motivate suppliers to develop proactive environmental management systems, as well, as improve their environmental performance (Simpson & Power, 2005; Rivera & Delmas, 2004). Therefore, the following proposition is made:

P₅: Incentives positively strengthen the relation between environmental commitment and environmental performance.

Conceptual Model

This Master Thesis presents a conceptual framework for examining the effect of resources and capabilities, environmental commitment and environmental collaboration on environmental performance. The model illustrated in Fig. 2-1 proposes a positive association between the independent variables represented by the dynamic resources and capabilities, environmental commitment, and environmental collaboration and the environmental performance as dependent variable. The relation between environmental commitment and environmental performance is moderated by two variables represented by environmental regulations and incentives. The arrows indicate the propositions relationships, and the plus sign indicate a positive relationship.

Figure 2-3: Conceptual Model – Author's own construct



CHAPTER THREE

RESEARCH METHODOLOGY

Introduction

The research is an explanatory analysis that is intended to investigate the environmental performance of leading companies operating within the oil and gas supply chain. The aim is to understand why companies sharing more or less similar characteristics of size and power and are operating under similar internal and external pressures have different environmental performance. This chapter presents methods and techniques used in collecting and analyzing data gathered. The choices of the research design are discussed together with the limitations encountered.

4.5. Research Design

This research is exploratory in nature and employs a qualitative approach in developing a deeper understanding of how environmental performance may be impacted by the changing conditions between the variables. Qualitative research provides a deeper understanding of phenomena studied in comparison to a research based purely on quantitative data (Silverman, 2001). In addition, qualitative research and exploratory design often involves small samples as this is deemed perfectly acceptable in a discovery-oriented research. The down side of it however, is that the interpretation procedures of small samples require subjective judgments, making it difficult to properly test the propositions (Zikmund et al., 2010). Consequently, researchers are increasingly giving more considerations to mixed methods research whereby qualitative and quantitative research techniques, methods, concepts, and approaches are mixed into an integrated mode (Yin, 2009). Incorporating quantitative data into qualitative research can enable researchers collect a richer and stronger range of evidence and test and revise their generalizations in order to clarify the accuracy of their impressions about the data presented (Silverman, 2001; Yin, 2009).

4.6. Sampling design and techniques

The availability of resources, costs, and time constraint were taken in considerations when selecting a sampling design. Therefore, judgment or purposive sampling technique is used in this research, in which an experienced individual selects the sample based on his knowledge and judgment of sampled companies and characteristics required (Zikmund et al., 2010). The companies were selected with the help of a coordinator in the Norwegian Offshore and Drilling Engineering (NODE), environmental footprint project. The sample is composed of six companies that are members in NODE business cluster operating within the oil and gas industry located in East and West Agder in Southern Norway. The companies sampled are considered as 1st tier suppliers. In addition to the geographical location of the sample, the focus of the companies' activities was factored into the selection. An initial phone call to the focal point contact persons listed on NODE contact list was made to introduce the research project and was subsequently followed by e-mail that highlighted the specific focus of the research.

3.4.1. Sampling frame

In order to achieve more accurate results, the elements of the sample chosen are quite similar and portray characteristics of interests. Specific functional managers were interviewed. Those included product quality managers, procurement managers, health, safety, environment (HSE) managers, and quality assurance managers. However, a sampling frame error can occurs when certain sample elements are not accurately represented in the sampling frame (Zikmund et al., 2010). This was evident in the inability of some of the interviewed managers to provide adequate answers to certain questions.

4.7. Methods of data collection

Exploratory research may be applied through different approaches, such as literature research, experience survey, individual in-depth interviews, case studies, and surveys (Zikmund et al., 2010). Some of those methods are qualitative and include quantitative data. While qualitative data may be critical in explaining or testing the propositions, the embedded units can generate fine-grained quantitative data (Yin, 2009). This research follows a triangulation technique, through the combination of literature review, a case-study approach and survey technique to

collect data about the constructs studied in order to understand and explain the differences in companies' environmental performance.

Scope of the literature review

Literature review is a valid approach and forms an integrated part of any research (Easterby-Smith et al., 2002). In order to see whether previous studies have already addressed similar research problems, an extensive review focusing on empirical literature concerning the determinants of environmental performance and latent constructs was done using Google Scholar. The university research engine provided access to other databases such as Elsevier Science Direct, JSTOR, Springer Link, PERGAMON, Emerald, and Wiley InterScience. The criterion used in selecting the articles was empirical in nature. It included theoretical considerations and empirical case studies as a source for secondary information on environmental management and environmental performance. The literature review was classified in two contexts, one related to the problem context and the other to the methodology approach. The research time span was restricted to the period between 2000 and 2012 with the aim to trace the latest developments in green supply chain management in general and identify trends in environmental management and environmental performance in particular. Keywords used in the research included green supply chain management (GSCM), green supply chain management systems (GSCMS), green supply chain practices, environmental performance, environmental indicators and measures, environmental disclosures, dynamic resources and capabilities, collaborations and relationships, environmental commitments, Environmental regulations, and incentives.

Case study

A case study approach was chosen as it is deemed most suitable when the boundaries of a phenomenon are not clear and there is no control over behavioral events (Azevedo et al., 2011). A primary advantage of a case study is related to highly focused attention to details, which enable the researcher to study carefully the order of events as they occur or to focus on identifying the relationships among functions or entities (Zikmund et al., 2010). The case study employed both depth interviews and online survey.

Depth interviews

Out of the seven companies sampled for the research, only four agreed hesitantly to interview, a fifth one elected to answer the questions in writing, which took away the element of

probing, and two declined. Respondents were first contacted by phone to solicit their approval for interview, which was followed by explanatory e-mail to explain the specific focus of the research. Depth interviews were conducted on site with key purchasing, production, quality, health, safety and environment (HSE) senior staff within the companies. Each interview took one hour. The interviews were guided by a structured instrument questionnaire derived from the literature review; see Appendix I. However, certain questions received more or less emphasis, depending on the knowledge of the respondent and on his/her willingness to answer. The interviews were digitally recorded for subsequent transcribing. Following the second interview, the need to send the questions by e-mail in advance was obvious in order to make good use of time allocated for interviews and to facilitate a better understanding of the questions and subsequent collection of adequate data.

Since the data concerned was of a sensitive nature and subject to the personal judgment of the respondent, assurance of anonymity was a prerequisite when soliciting an interview. Assurance of anonymity was reiterated during the interviews in order to create a conformable atmosphere for information disclosure. However, despite the given assurance of anonymity some respondents kept trying to protect themselves and their company's image. Nevertheless, depth interviews were useful in the sense they provided considerable insight from each respondent and revealed characteristics of different environmental performance behavior. Following the first interview, the instrument was revised and evaluated. Follow ups and clarifications were done through e-mails or on the phone.

Survey questionnaire

Surveys provide quick, efficient, and accurate mean of assessing information about the phenomenon studied. They are quite flexible and provide extremely valuable data when properly conducted (Zikmund et al., 2010). The environmental performance of the sample case study was examined using online survey. The survey is intended to supplement the interviews conducted. The survey instrument to measure the theoretical constructs was initially developed based on literature reviewed (Rao, 2002; Rao & Holt, 2005; Vachon & Klassen, 2005; Vachon & Klassen, 2006; López-Gamero et al., 2010). However, following the interviews, the survey questionnaire was revised and modified to further refine and clarify the idea and items of the research model. Both, interview questions and survey questionnaire were passed to the focal point coordinator in NODE for review and comments to ensure that questions are clear and easy to understand and avoid item ambiguity; see Appendix II.

The survey is developed using SurveyXact 6.1 software. The majority of indicators are measured using five points Likert scale with a set of values that can be used to express an opinion. The five points scale was necessary to reserve the scaling with negative statements (Zikmund et al., 2010). Consequently, a large number of statements presented are classified within favorable or unfavorable range. The survey was distributed to the original sample of seven companies. Follow up reminders were made by phone and e-mails to ensure that respondents complete the survey questionnaire before the close date. The response time was set for 10 days. Six companies completed the questionnaire and one was partially completed, therefore it was excluded from the analysis. Consequently, the accepted response rate was 85.7%.

	Distributed	Respondents	Percent
Created	7		
Partially completed/Rejected		1	14.3%
Completed/Accepted		6	85.7%
Total	7	7	100.0%

Table 2-1: Status of survey questionnaire

3.4. Operationalization and measurement of variables

Variables describe the different values in a concept. Because variables can be measured, their operationalization is done by identifying the actual measurement scales to assess the variables of interests (Zikmund et al., 2010).

3.4.1. Control Variables

Three control variables were used to establish holding conditions constant between all firms interviewed in order to reduce the risk of attributing explanatory power to independent variables (Zikmund et al., 2010), (Se Appendix III).

Company size

The company size was used as a control variable measured by the number of its full time employees located in Norway. Studies suggest a correlation between the size of the company and the feasibility of environmental performance (Patten, 2002). One argument is that big

companies have more flexibility to devote resources for environmental management (Gonzalez-Benito & Gonzalez-Benito, 2005).

Company internationalization

This variable was included to distinguish those companies that are part of multinational corporations. The internationalization of the company is expected to have an effect on resources, knowledge, and experience transfer between the companies. Another argument for the internationalization is that companies have the tendencies to define their environmental policies in accordance to prevailing environmental requirements in the country where they compete.

Industry focus

A focused industry approach was used to control for the type of products and services offered by the companies surveyed.

3.4.2. Dependent variable

3.4.2.1. Environmental performance

Literature provide for different methods to measure environmental performance. In this thesis, the environmental performance is measured against the company's environmental practices, internal audits, and the environmental certification. To measure environmental practices, 17 composite measures are identified from literature that consisted of items related to green purchasing, efficient use of resources, environmental investments, and environmental disclosure. In addition, internal audits activities verified during the interviews are also considered part of the environmental practices. Each item on the survey questionnaire is measured on a 5-points Likert scale ranging from (Strongly disagree = 1 to strongly agree = 5). Environmental certification is considered as a second measurement for environmental performance.

3.4.3. Independent Variables

Environmental commitment

A measure for environmental commitment was drawn from existing literature and evidence presented by suppliers' case studies (Simpson et al., 2007). The measurements are expressed

by a 5-points Likert scale ranging from (Strongly disagree = 1 to strongly agree = 5) and consist of five items relating to:

- *Benefits envisaged*
- *Organization's goals and the environmental management system*
- *Commitment to investment decisions*
- *The process of selecting and monitoring the suppliers*

3.4.3.1.1. Environmental selection indicators

A number of indicators are tested for relevance in the supplier selection process. Those included the level of environmental commitment exhibited by the supplier and his process management. In addition, the environmental quality, responsiveness and flexibility are measured for their relevance in the selection. Finally, the product environmental characteristics are also included as criterion because they have correlation effect with the environmental quality.

In addition, an assessment of the drivers, barriers and benefits associated with environmental commitment and resources and capabilities are tested in order to have a better understand of the phenomenon studied. Those are tested by indicating the order of relevance ranging from (Not relevant = 1 to Very relevant = 5).

Resources and dynamic capabilities

Dynamic resources and capabilities facilitate the stimulation of value creation and promote the environmental performance of firms (Chen and Jaw, 2009). To measure the extent resources and capabilities affect the environmental performance of a firm, 8 items are used to assess the strength of the companies, the level of investments and reliance on complementary resources. Each item is measured on a 5-points Likert scale ranging from (Strongly disagree = 1 to strongly agree = 5).

Environmental collaboration

In order to capture the extent of collaborative activities and to establish a causal linkage with the degree of change in environmental performance, a scale of 10 items is derived from existing knowledge in supply chain literature (Vachon & Klassen, 2008). Each item is

measured on a 5-points Likert scale (Never = 1, rarely = 2, Sometimes = 3, most of the time = 4, and always = 5).

3.4.4. Moderating variables

Environmental regulations and incentives are used as moderating variables and are assumed to have a contingent effect on the relationship between environmental performance and environmental commitment.

Environmental regulations

Environmental regulations act as a compelling behavior moderator. To test the perception of environmental regulations, 5 items are used that are measured on a 5-points Likert scale ranging from (Strongly disagree = 1 to strongly agree = 5). The interviews also brought to surface a number of issues related to the application of the environmental standards.

Incentives

Incentives are usually seen as conducting a voluntary behavior, thus, they are seen as helpful in reinforcing commitments. The perception regarding the use of incentives and environmental initiatives is tested using 8 items that are measured on a 5-points Likert scale ranging from (Strongly disagree = 1 to strongly agree = 5).

4.8. Reliability and Validity

An ideal measurement is one that reflects the true score or value of the characteristics or measure what is suppose to be measured (Zikmund et al., 2010). Reliability, credibility are two different criteria for evaluating measurements.

Reliability

According to Zikmund et al. (2010), reliability is an indicator of internal consistency. A measure is reliable when the same results converge following comparable measuring attempts. The more reliable the measure, the lower is the random error observed in the equation for observed scores. A general approach to the reliability issue is to operationalize as many steps as possible (Yin, 2009).

The reliability of interviews is a central question in quantitative methods (Silverman, 2001). In order that each respondent understand the questions in the same way and that answers can be transcribed with minimal uncertainty, identical e-mails were sent to all respondents explaining the aim of the research and the phenomenon being researched and highlighting the key indicators. The questions were also sent in advance so that respondents are aware of what information are sought, which would facilitate a better use of time and help the probing process and subsequent collection of adequate answers. For internal consistency all companies were asked the same questions. All face to face interviews were recorded and subsequently transcribed in accordance to the need of reliable analysis. Extract of the interviews are presented in the research, and sometimes reference is made to the question that provoked the answer.

Validity

Validity is synonym to accuracy and truthfulness, therefore, a measurement instrument is defined by the extent the different scores reflect true differences among the characteristics measured (Zikmund et al., 2010). When a measure is valid then the observed value equal the true value. Construct validity is concerned with identifying the correct operational measures for the concepts being studied. This can be achieved through using multiple sources of evidence in a way that encourage convergent lines of inquiry (Yin, 2009). The survey instruments consist of a pool of items that were identified from the literature and empirical case studies.

Keeping with internal validity that seeks to logically explain the causal relationships between the concepts (Yin, 2009), respondents were asked to provide copies of their environmental disclosure reports and the questionnaire used to assess, select, and monitor the suppliers' environmental performance. However, none was received despite the promises. Therefore a cross comparison was made between the data captured during the interviews and the one collected through the survey questionnaire in order to test the logic commonality provided in the responses and subsequently test the propositions relationships of the research model.

Although the sample units were similar which would normally help portray accurately the characteristics of interest, the interviewees were not all able to provide definitive answers on all constructs investigated. Thus, the answers provided were influenced by the opinions of

the sample units. This limitation highlighted the need to include top management in future research. In addition, the interviews were conducted in English, posing a challenge to some interviewees to express themselves clearly, therefore, the probing questions focused on clarifying what was exactly meant by the statements made. Consequently, the sample bias may have created a tendency to deviate from the true value of the population parameters (Zikmund, et al. 2010). Therefore, in order to reduce the risks of bias, the analysis of scale items from different constructs was done separately or combined when necessary. Statistical tests were used to negate bias generated by the interviews. A final limitation is related to the survey questionnaire, which was not subjected to pilot test prior to the survey due to time constraint.

4.9. Data analysis

Yin (2009) identifies four general analytical strategies that rely on theoretical propositions, developing case descriptions, using both quantitative and qualitative data, and examining rival explanations. The analysis of the proposition is based on “how”, “why”, and “what” questions, which have shaped the data collection plan and formed the basis of the survey instruments. The descriptive insight helped quantifying the data; consequently, some items of no relevant value to the outcome are dropped from the survey and some answers are combined when deemed necessary. Frequency and index analysis are applied to check the metric distribution of the variables and eliminate any potential distortion. Other simple statistical measures are used such as calculating the scores, which can help in analyzing and describing the findings.

CHAPTER FOUR

PRESENTATION OF FINDINGS

4.0 Introduction

The purpose of this chapter is to present findings established during the study with the aim to find what drives environmental performance in this segment of industry. The presentation is guided by the research model, whereby the main objective is to examine the effect of every variable on environmental performance.

4.1. Environmental performance

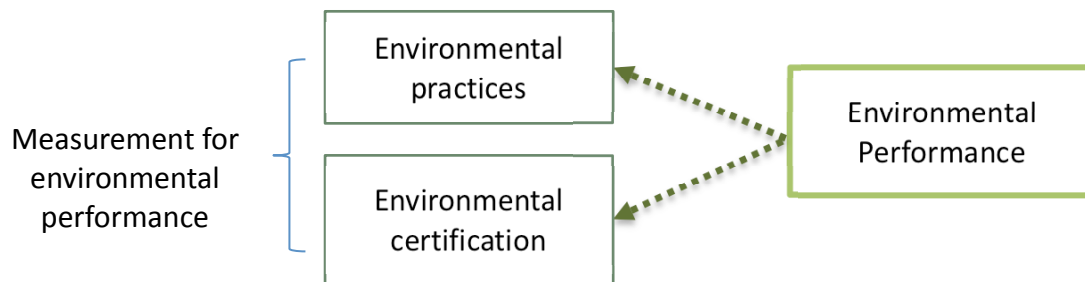


Figure 4-4: Environmental performance variable

4.1.1. Environmental Practices

The sample surveyed has many of common characteristics in terms of industry focus, size, QHSE units, and certification (Table 4-1 and Appendix III). With respect to internationalization, 83% of the sample interviewed is part of an International Corporation. However, despite the similarities, the findings indicate that the size of the firm has no real impact on the level of environmental performance in the six cases studied, as indicated in (fig.4-2).

Companies	Industry focus	No. employees Norway	QHSE Unit	ISO 14001 Certification / Other Certification	International Company
Company A	Offshore Drilling	Over 1,000	Yes	Other	Yes
Company B	Offshore Drilling	Over 1,000	Yes	ISO 14001	Yes
Company C	Offshore Drilling	400 to 599	Yes	Other	Yes
Company D	Offshore Drilling	250 to 399	Yes	ISO 14001	No
Company E	Engineering	Under 100	Yes	Other	Yes
Company F	Offshore Drilling	100 to 249	Yes	ISO 14001	Yes

Table 4-1: Companies characteristics

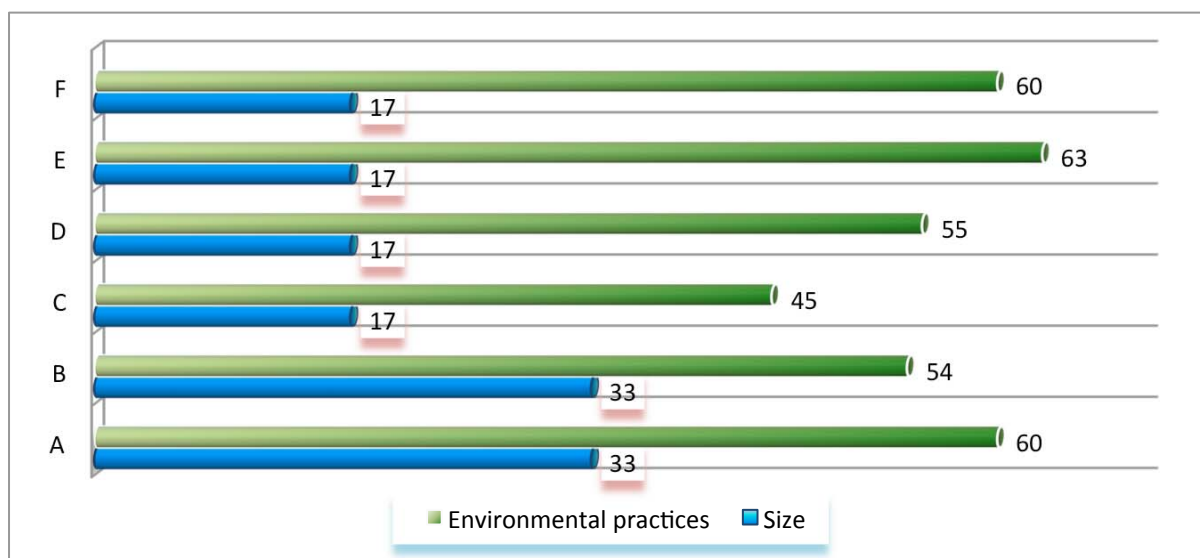


Figure 4-2: The size of firms and the level of their environmental performance (See Appendix IV for clarification)

Environmental performance is reflected through the firm practices and activities. Most of the results show a positive relationship between environmental management practices and environmental performance (Appendix IV, Table 1). Environmental practices are mainly emphasized in recycling activities (79.17), in the collaboration with customers (75.00) and suppliers (66.67), and in the usage of environmentally friendly material (70.83). The usage of clean technology (66.67) is positively associated with the increase in investments (66.67). Rewarding and supporting new ideas for identifying areas for improvement received a moderate score (58.33). The results also show that green purchasing practices receive an average consideration (54.17), while annual environmental disclosures seems to reflect a compliance requirement for environmental reporting (50.00). With the exception of one company, none of the other companies surveyed had any environmental information or annual environmental disclosures publicized on their company's website. This was denoted by the low score for public disclosures (45.83). The results also show an average association with environmental performance in regards to resources utilization (average 52.78), and the use of environmentally friendly transportation (54.17). No significant interest in recovery of the product at end-life cycle (50.00) is noted. Scores that are below the mean value of (50.00) have a negative effect on the overall environmental performance.

As part of the duties of the environmental management systems, the companies conduct internal audits at least once a year. Those audits are based on the applicable regulatory

standards used by the companies, such as OHSAS or ISO 14001, Achilles, FPAL, and NORSOK S-006 with the aim to continuously improve processes and conditions.

“An environmental aspect review is carried out at least once every year for our certified sites.”

“We conduct internal environmental audits and those are usually measured against a set of environmental performance indicators set out in the HSE Operating System.”

4.1.2. Environmental certification

All companies surveyed have an environmental certification of some sort. Those certifications follow different environmental standards such as ISO 9001 and 14001, Achilles, FPAL, and NORSOK S-006. Only three companies have ISO 14001 certification and among the remaining three, only one is pursuing this certification for the year 2012. The other two companies are not convinced of the usefulness of this particular certification and prefer to observe first the effect of such certification on their competition.

“We know that our two big competitors may be certified, so we have to see what the value is and what the market requirements are.”

4.2. Environmental commitment

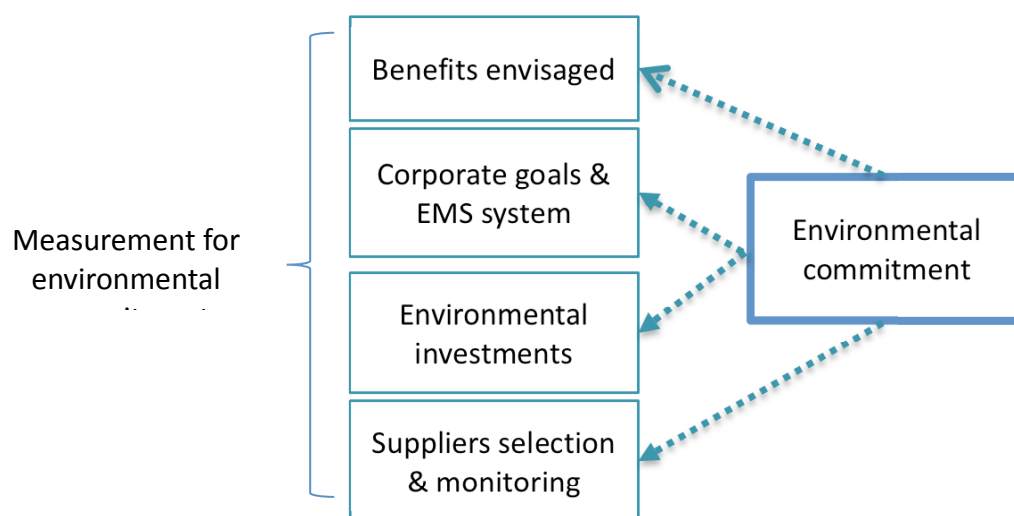


Figure 4-3: Environmental commitment variable

4.2.1. Benefits envisaged

The result show that the potential benefit gained from being an environmentally performing company is strongly emphasized in improved corporate image (75.00) and improved environmental compliance (75.00). Market opportunities (62.50) and quality improvement (58.33) are also perceived as potential gains that would influence an environmental commitment (see fig. 2). These benefits correspond to a high degree with the drivers for environmental commitment.

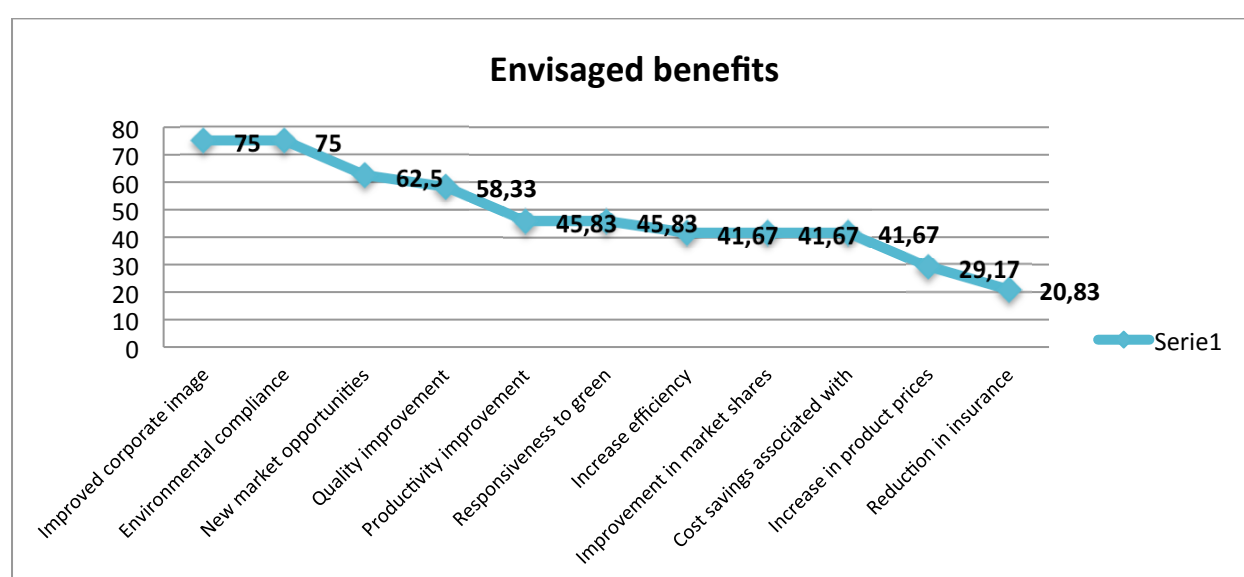


Figure 4-4: Envisaged benefit from an environmental performance

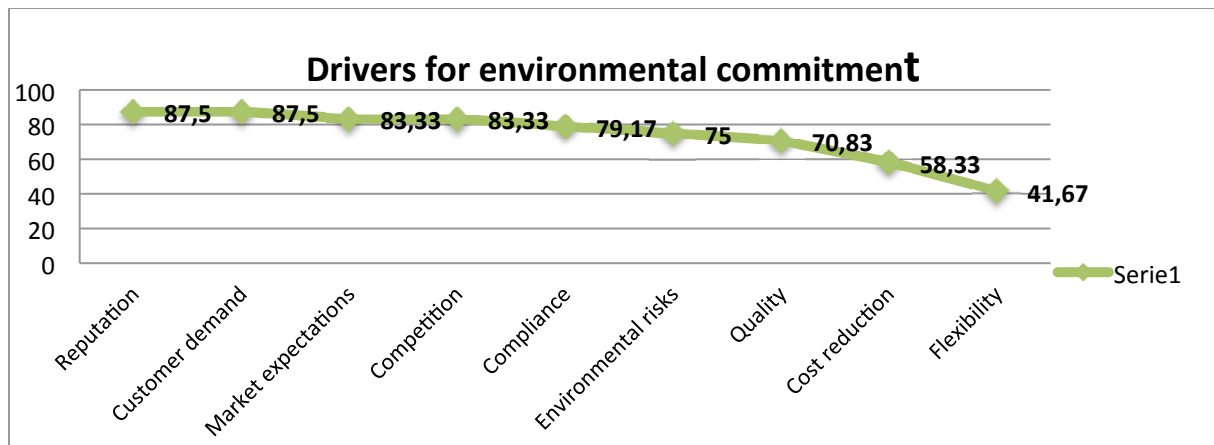


Figure 4-5: Drivers for environmental commitment

Drivers for environmental commitment emphasize the importance of the firm's reputation (87.50) and the need to respond to customer demand (87.50). The pressure of competition (83.33) and legislative compliance (79.17) are also perceived as strong drivers. The need to attend to environmental risks (75.00) necessitates a need to improve quality (58.33). Although, companies seek to achieve cost reduction (58.33), this however, is not much realized in reality (41.67).

Those drivers were also emphasized during the interviews:

"Our customers are very much interested in how much environmentally friendly our products are and what kind of solutions we use."

"... we have a need to maintain an environmental focus because the risk is very high."

4.2.2. Organization's goals and the environmental management system

Evaluating the direct relationship between the companies' environmental commitment and environmental performance revealed that companies surveyed have relatively a strong sense of environmental commitment. This is mainly emphasized through the corporate strategy (83.33), corporate goals and environmental policies (79.17). Environmental commitment is also portrayed through awareness programs (62.50) and collaborative efforts with suppliers and customers (62.50). The results also show that environmental commitment through green purchasing is subject to contract specificity that is stipulated by the customer (58.33).

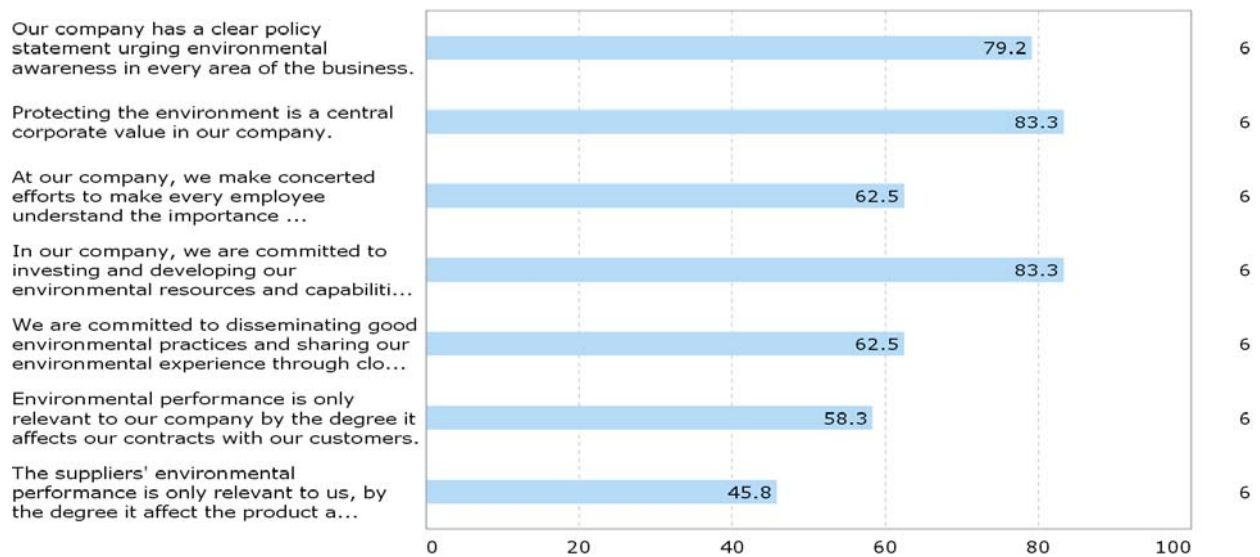


Figure 5-6: Analysis of environmental commitment

4.2.3. Commitment to investment decisions

The commitment to invest in the development of green capabilities is denoted by a high score (83.33). Strong commitment to investing in green capabilities was also expressed during the interviews:

“... we do not hesitate investing in new technologies or processes that would enhance the environmental performance of our company.”

4.2.4. Supplier selection and monitoring

The results show that the environment as a selection criterion is rarely considered in the selection process (37.50). Such criterion is not recognized a priority in the selection process (20.83) and is offset by requiring the supplier to have ISO 14001 certification (50.00). The suppliers are also asked to commit to environmental actions such as waste management (62.50) and provide regular updates on their environmental performance (54.17).

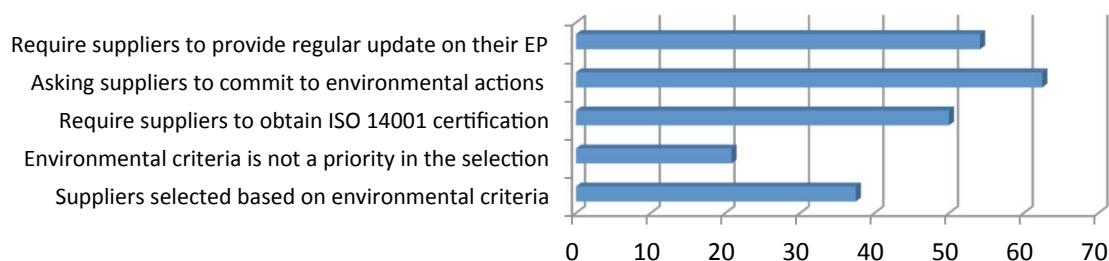


Figure 4-7: The selection process of a supplier

Results reveal that companies surveyed are reasonably engaged in evaluation and monitoring activities. The average score is due to the large number of suppliers, which makes it difficult to

follow closely on all of them. This is also due to time constraints and capacity limitations reported under barriers for environmental commitment.

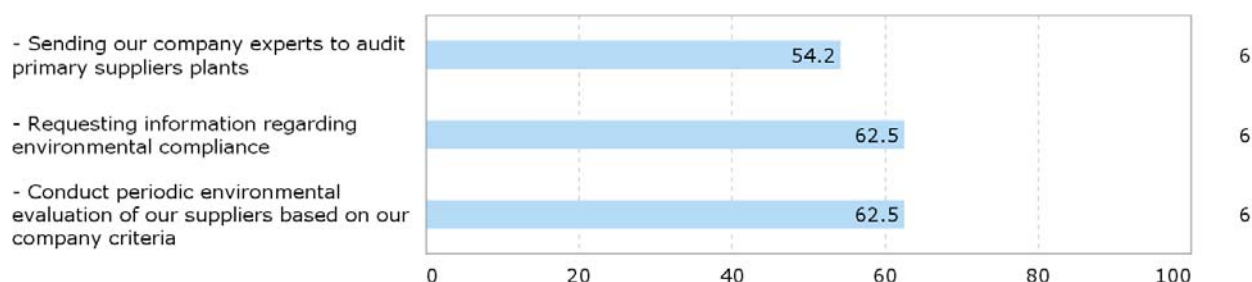


Figure 4-8: Monitoring suppliers

Companies were asked to indicate by order of relevance what indicators do they perceive as relevant for the selection of suppliers. Results show that the supplier commitment is viewed, by the level of certification (66.67) and the number of violations (62.50). The supplier is also assessed by the number of environmental initiatives (58.33) and the extent of self-monitoring (50.00). The environmental reporting of the supplier rated low (45.83) in the selection criteria, and this is associate with the low confidence in environmental disclosures, expressed during interviews.

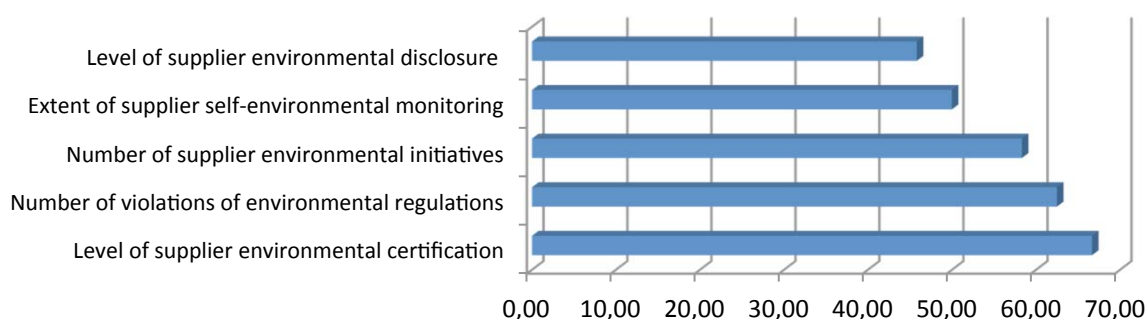


Figure 4-9: Indicators of suppliers' environmental commitment

In assessing the supplier's process management, indicators related to risks such as spillage, leak and pollution are perceived very important, followed by the level of waste (58.33) and air emission generated (54.17).

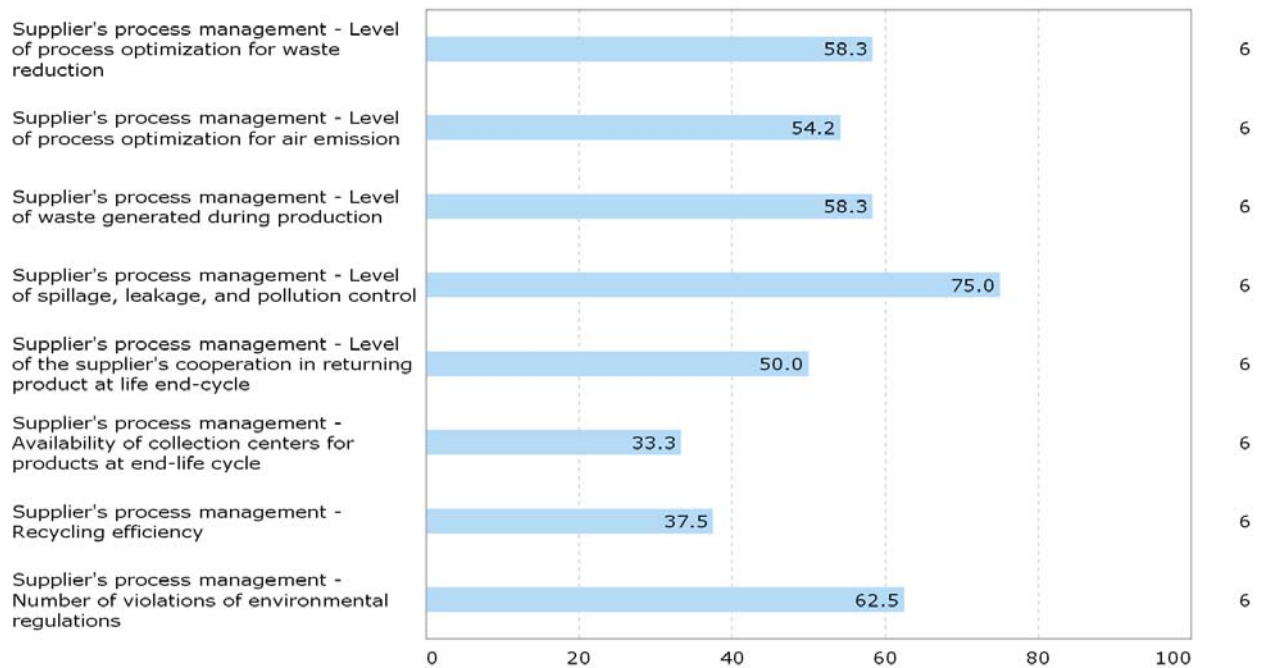


Figure 4-10: The supplier management process as selection criteria

4.2.4.1. Environmental indicators

The product characteristics have an impact on the product life cycle. Thus, based on the definition of environmental commodity provided in Handfield et al. (2005), the quality is tested in parallel to the product environmental characteristics, which is considered a critical indicator for environmental risk in use and disposal. The results show that the only link between the product characteristics and quality is related to the level of pre-processed raw material (66.67) perceived as high environmental risk (58.33). Other quality qualifiers ranked on average (50.00). Responsiveness to green requirements was also viewed as imperative, with emphasis on 'on-time' delivery (66.67). The need for flexibility and ability to adjust was also regarded important, with emphasis on the need for production flexibility (62.50). During the interviews, environmental risks were repeatedly flagged as big detrimental for a company's reputation; therefore, the supplier environmental selection is very important:

"We cannot afford not to be robust about our suppliers environmental behavior, and performance, because a disaster such as that of the Gulf of Mexico will focus on the companies that were involved in either supplying parts, technology, installing, assembling or servicing equipment, and this can cost us credibility and will hurt us badly in the market regardless whether or not the disaster has anything to do with our company."

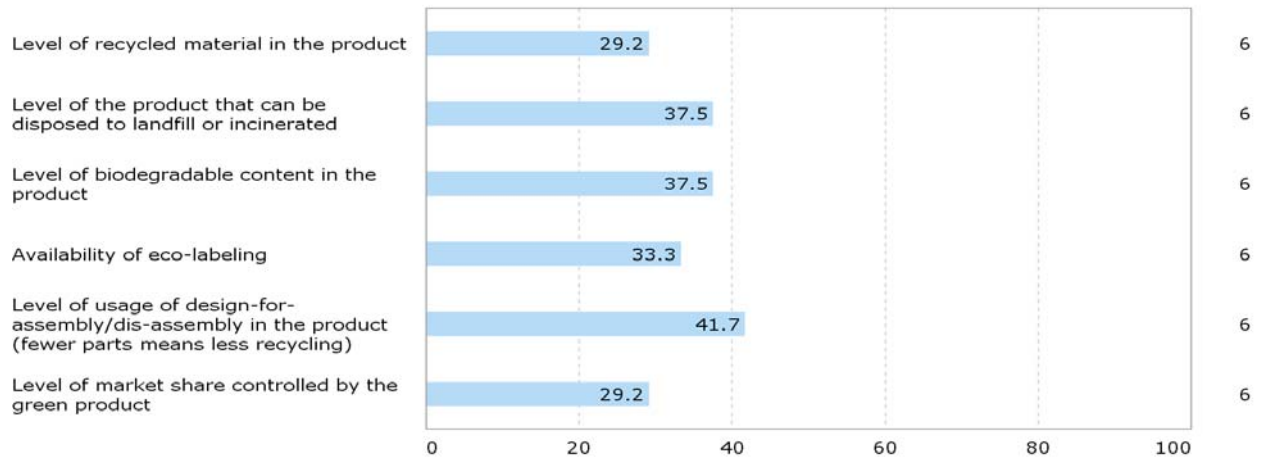


Figure 4-11: Product's environmental characteristics

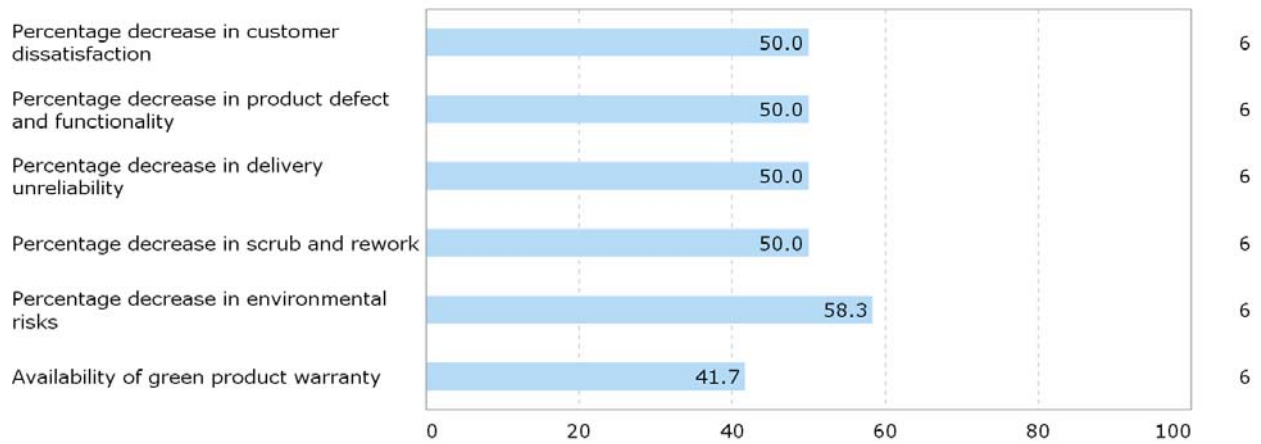


Figure 4-12: Environmental quality

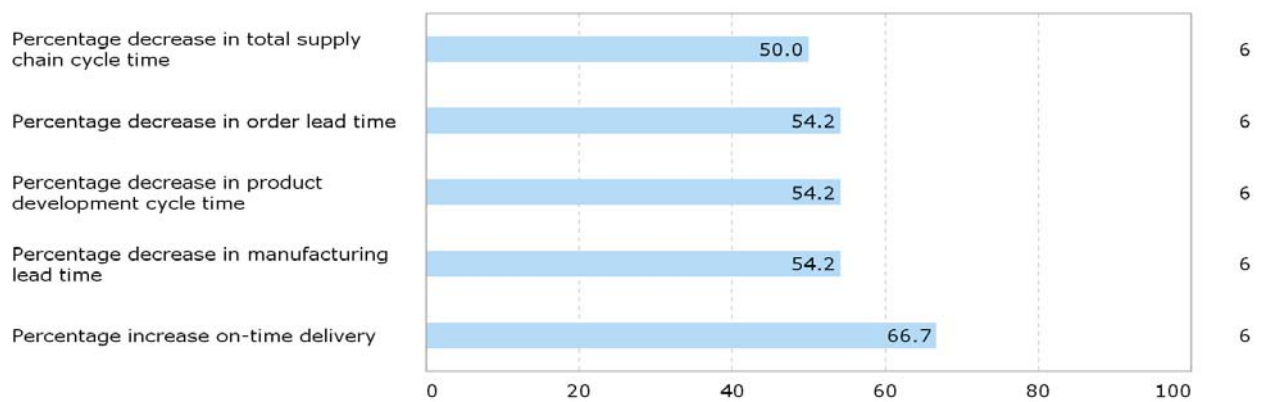


Figure 4-13: Responsiveness to green requirements

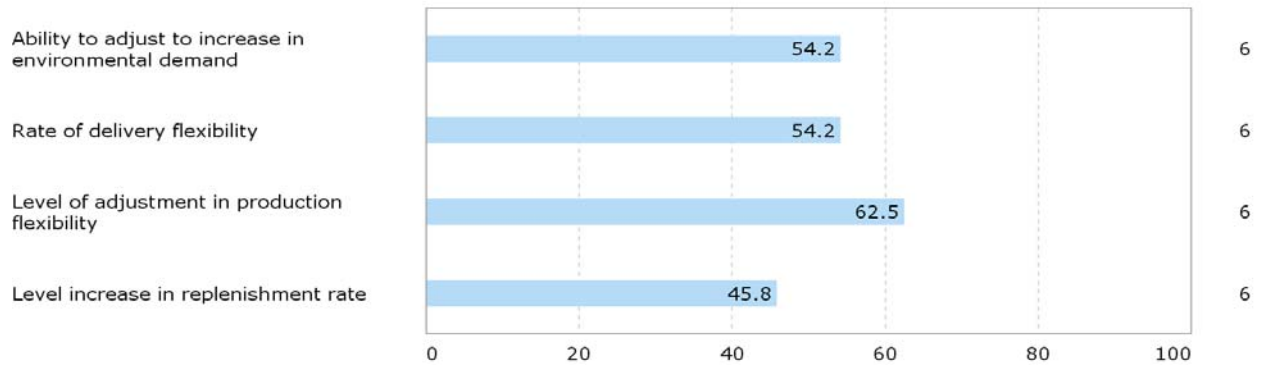


Figure 4-14: Flexibility and ability to adjust to environmental requirements

4.3 Resources and dynamic capabilities

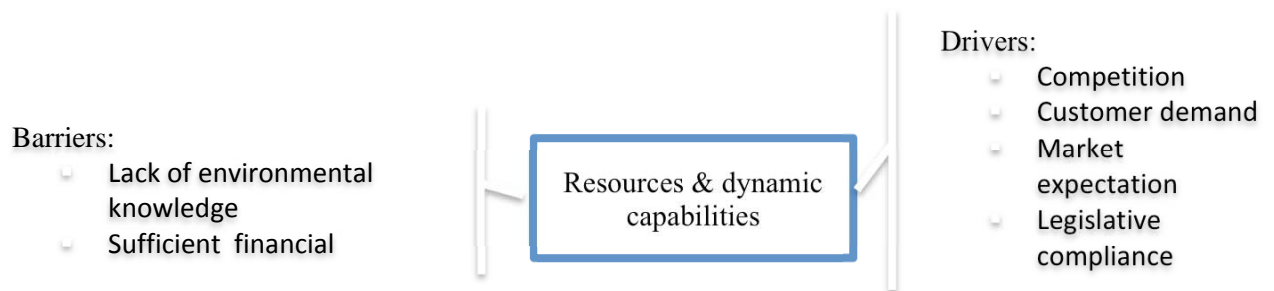


Figure 4-15: Resources and dynamic capability variable

The results of this study demonstrate that the companies surveyed have a good base of resources and capabilities emphasized by a strong financial base (79.17), technical skills (75.00), and good organizational intelligence denoted in leading information systems (75.00). This is enhanced by the capacity to effectuate innovative capabilities combinations (66.67), by the accumulation of environmental technology (58.33), and supported by sufficient internal and external resources (62.50).

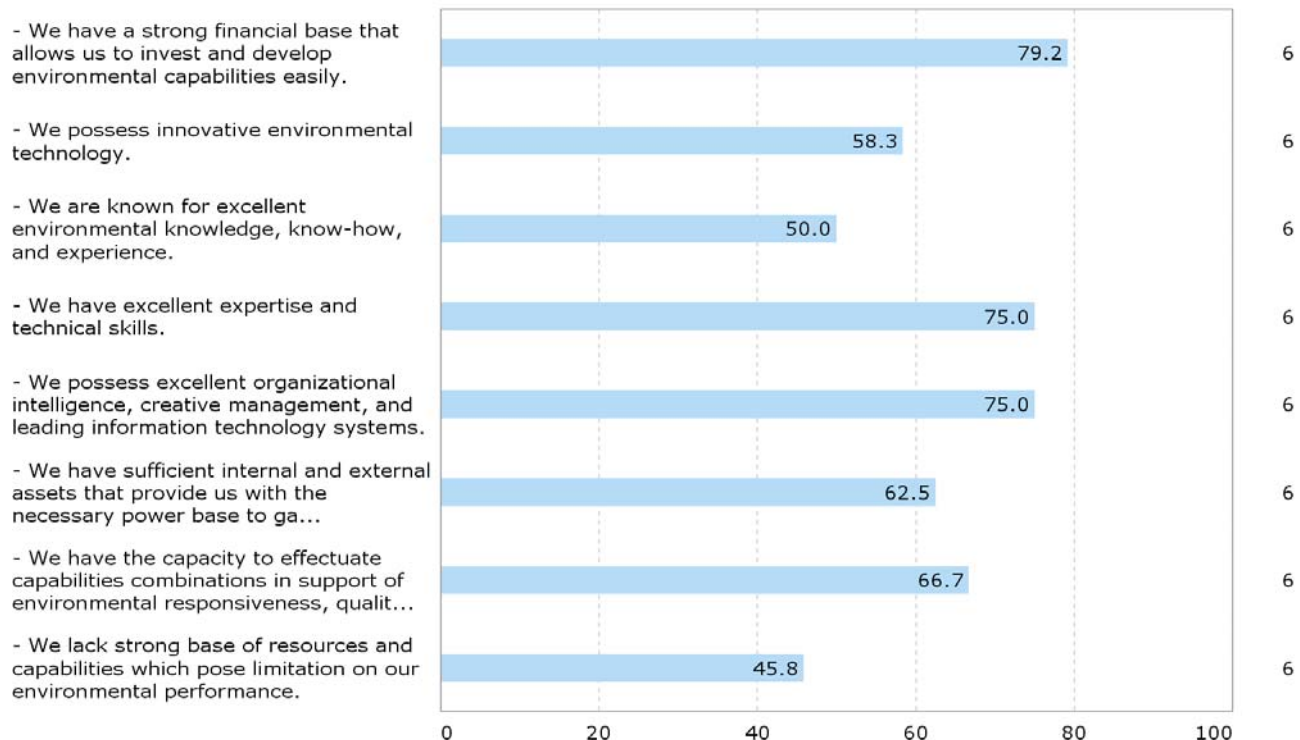


Figure 4-16: Firms resources and capabilities

However knowledge as a resource is captured with an average score (50.00) and is subsequently noted as one of the deficiencies in achieving high environmental performance. The findings are also reaffirmed during the interviews:

“... we recognize the need to be innovative in technology and processes in order to minimize the negative impact from the environment.”

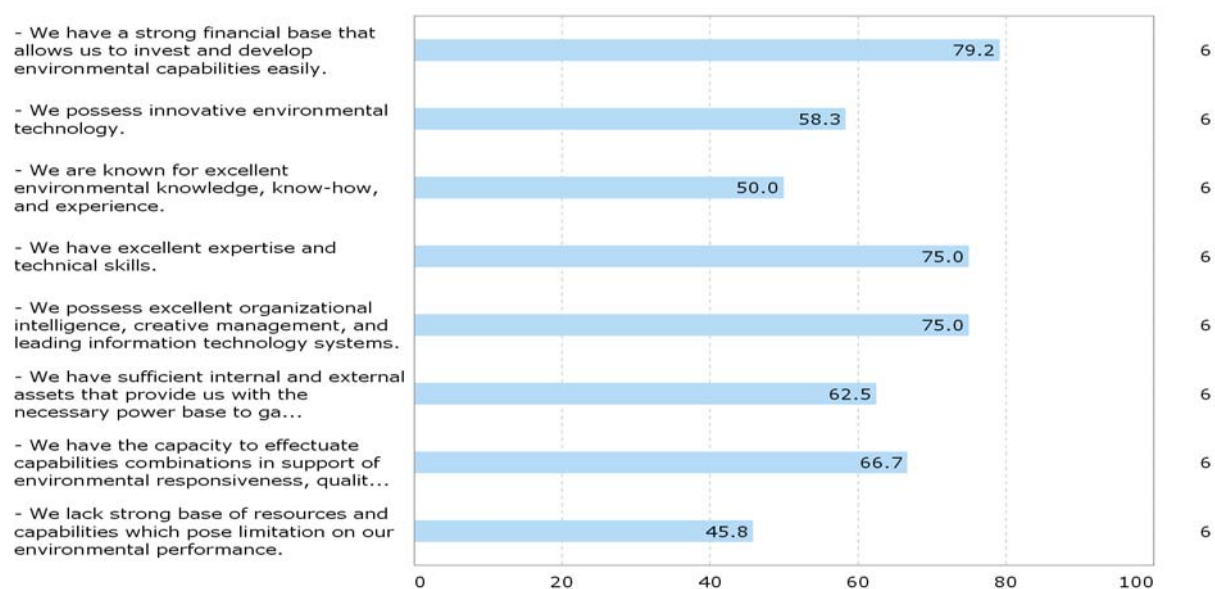


Figure 4-17: Firms 'resources & capabilities

Based on the feedback received during the interviews in regards to knowledge capacity, a specific question was included in the survey questionnaire regarding the kind of knowledge companies need in order to improve their environmental performance. The results indicate a strong need for training and seminars (66.7), government support with regular updates and information (50.00), and a need for technical assistance (33.3), as expressed in (fig. 4-16).

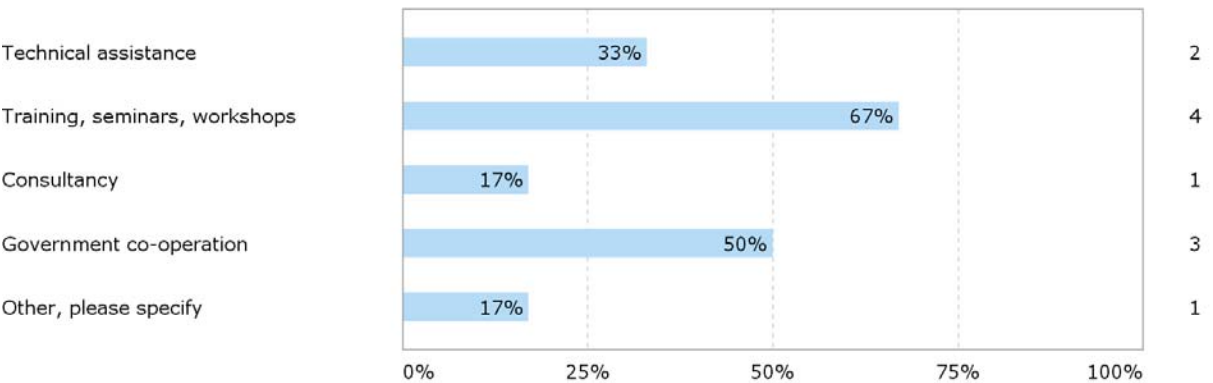


Figure 4-18: Knowledge required in order to improve environmental performance

4.4. Environmental collaboration

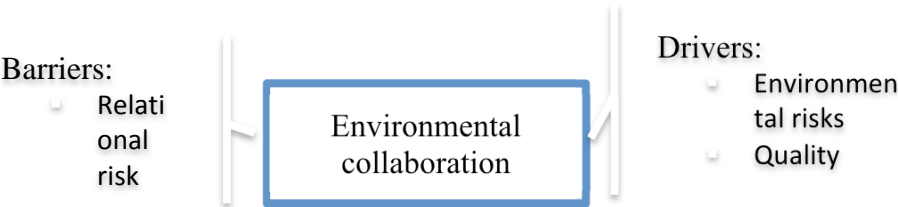


Figure 4-19: Environmental collaboration variable

The results show an average level of collaboration with emphasis on more collaboration with the customer than with the supplier (66.67). Collaboration involves joint capabilities development in through joint planning (50.00) and collaboration with the supplier to reduce the environmental impact of products (50.00). It also involves sharing environmental policies and goals (50.00). The results reflect a moderate level of collaboration for the purpose of complementing resources and capabilities (54.17). No specific activities are indicated that would help second tier suppliers improve their environmental performance. However, during

the interviews, collaboration was expressed under specificity terms. Interviewees stated that collaboration is strong only when it is related to the production of tailored equipment:

“Most of the work we do is outsourced, so in that respect we do not much collaborate on that front, except in the event that the situation necessitate that. On the other hand, we are more engaged with those that are producing tailored equipment for us.”

“Since our equipment are tailored specific, we do collaborate with the supplier because they are producing it on our behalf.”

“... depends on the complexity of what they are producing and it depends on the technology requirements.”

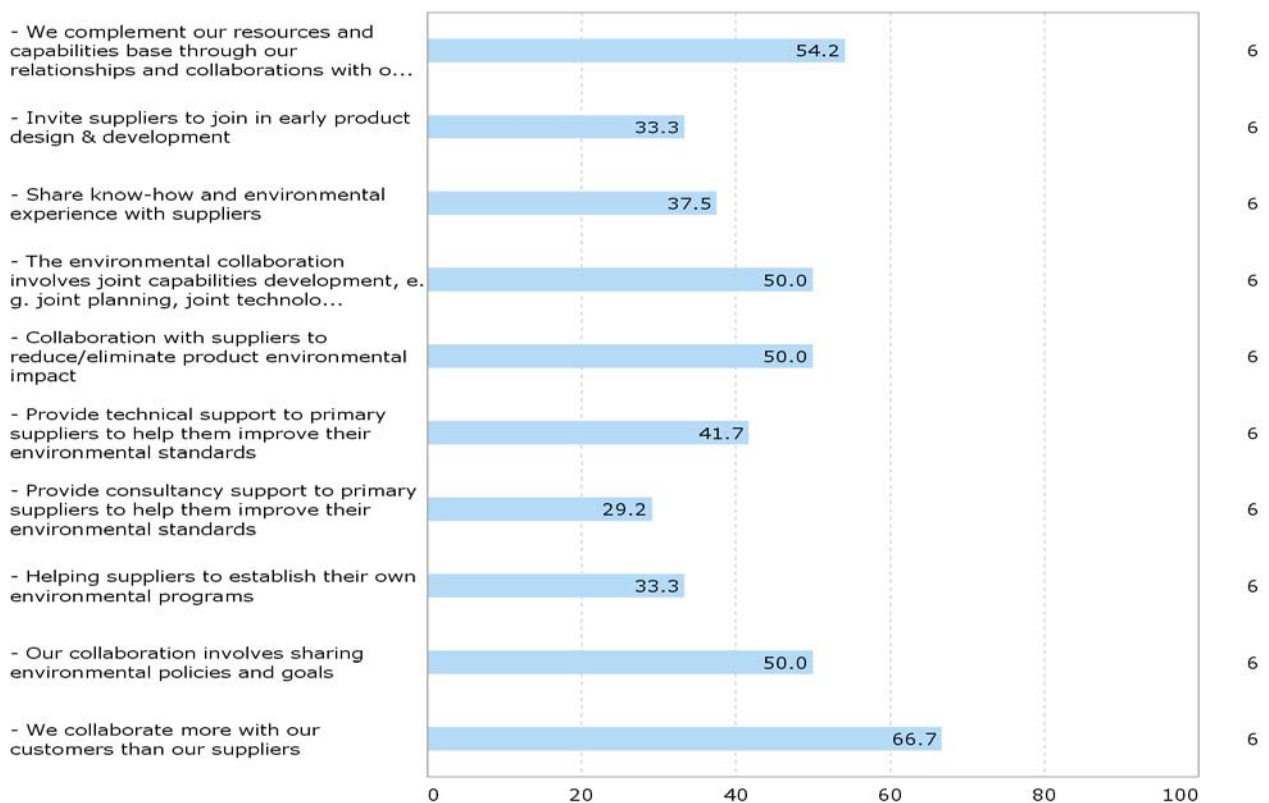


Figure 4-20: Extent of environmental collaboration

4.5. Environmental regulations

The results show an overall favorable perception of the environmental regulations. A positive relationship is seen between environmental regulations and market opportunities (83.33). The results also suggest that environmental requirements embedded in customers' orders can positively modify market demand and consequently the assessment and selection criteria of

suppliers (75.00). The need for stronger regulations control is strongly supported (75.00). This was also voiced during interviews:

“...we know we are not that controlled, that is why if the rules and regulations were more strict then we know that we are controlled and then of course we would do better.”

The results also show that companies believed in the necessity of the regulations (70.00) despite the cost they entail (50.00). The feedback from interviews portrays the environmental regulations as complex and hard to understand. In addition, the interviews brought to surface the issue of differences in the implementation of the environmental regulations across countries and the challenge it pauses to competitiveness:

“There is so much stipulated under the regulations that it is hard to understand the issues.”

“Norwegian laws and regulations say that we have to do be certified for the products sold within Norwegian waters, but when we sell equipment for Vietnam or China to be used in Chinese waters the regulations are different; so what do we do? How we compete?”

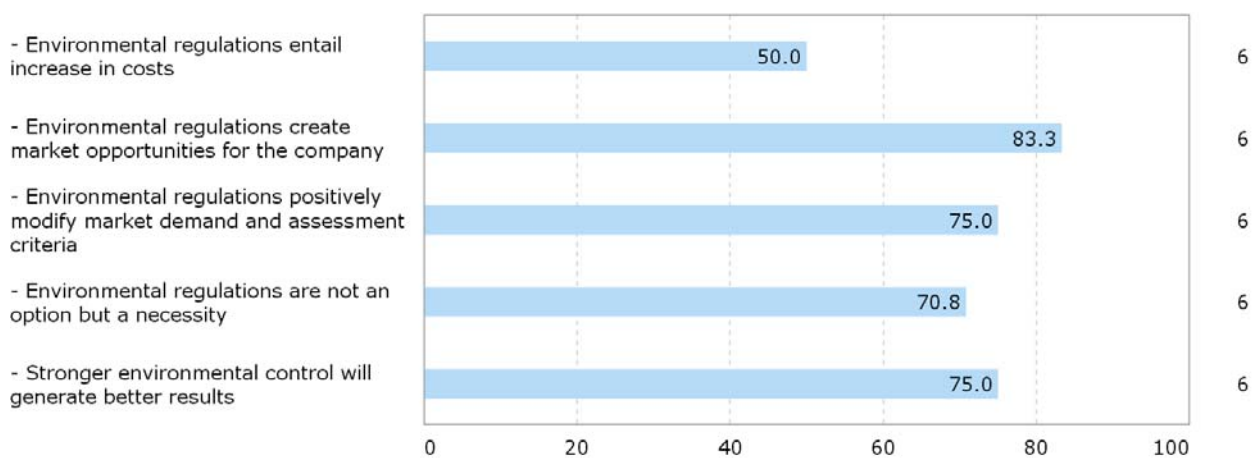


Figure 4-21: Perception of environmental regulations

Environmental incentives and initiatives

The attitude towards incentives and rewards is quite positive. Incentives and rewards are seen helpful in reinforcing commitment. The results show that incentives are perceived as important drivers for promoting environmental performance. Consequently if environmental regulations were tagged to incentives, they would yield better environmental responsiveness (70.83). Financial incentives are viewed to be very important (79.17), as well as support

program (75.00) and environmental initiatives (66.67). However, the results of the survey downplay the importance of rewards (50.00) as a sense of achievement and a useful tool in stimulating new ideas for improvements. The results also reflect a positive view regarding the importance of suppliers' incentives in promoting a better environmental performance among suppliers (70.83). However, this is acknowledged through preferential treatment practices (62.50) and not through implementing environmental programs with suppliers (41.67). Interviews also revealed a strong support to an incentive approach to encourage and promote better environmental performance:

“It would help the total environmental efforts when companies that show good environmental performance, are rewarded. “

“... it is a good motivation,... should reward developments and improved environmental solutions.”

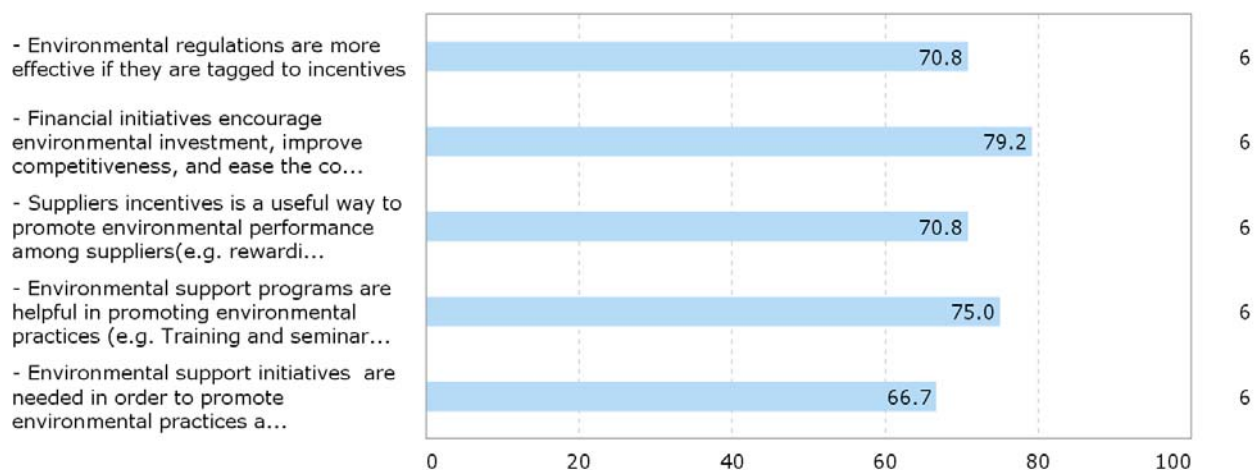


Figure 4-22: Perceptions of environmental incentives

CHAPTER FIVE

DISCUSSION OF FINDINGS

5.0. Introduction

This chapter presents a discussion of key findings and examines the path process between the different variables. The path process highlights some determinants issues that have implication on environmental performance, such as the need for environmental indicators in the assessment and selection process of suppliers. It also shows how the interrelations of commitment, collaboration, resources and capabilities shape the outcomes of environmental performance; and the moderating effect of environmental regulations and incentives on environmental commitment. The discussion is followed by a conclusion that summarizes issues discussed, explains the limitation, and finish with the different implications of this study on managers and policy makers.

5.1. Environmental Performance

5.1.1. *Environmental practices:*

The relation between the size of the firms studied did not hold as a determinant for environmental performance. The results show that big size companies have the same outcome performance as the small sized ones. The results are consistent with literature evidence that the firm size may reflect legitimate visibility; however, it is not considered a determinant for environmental performance (Aragon-Correa et al, 2008; Lopez-Gamero et al., 2009). However, notable differences exist between firms of the same size, as is the case with company C. This may be attributed to capacity and resources constraints. Environmental performance is regarded as the outcome of environmental practices. The level of performance between the firms is closely correlated with emphasis on certain internal environmental processes such as recycling. This means that companies proactively engage in practices that are relatively easy and mandated requirements. Most of the companies interviewed are lacking internal reward systems for supporting new ideas to improve environmental performance. Technical environmental capacities are upheld with the use of clean technologies and increase in environmental capabilities investment. The average score for green purchasing practices can be attributed to the non-availability of measurable environmental indicators, which make the

process of selecting and assessing suppliers based on an environmental criteria a challenging task. In addition, the low level of public environmental disclosure on the company website is an indication that companies report on their environmental activities as a matter of compliance only and it is not the result of proactive environmental engagement.

“It is time consuming... we do it because we are mandated to report, otherwise we would not bother”

Interviews revealed mix feelings about environmental reporting. In one hand, disclosures are regarded as a marketing tool, or as a proxy for legalization. On the other hand, they are regarded helpful for benchmarking and for measuring what has been achieved, what is still pending and where to improve. Thus, no significant relation was established between the environmental reporting and environmental performance. Therefore, mandatory reporting is not a definitive indication of environmental performance. Consequently, the findings of this research appear to be in contrast with previous studies that have noted a direct relation between environmental performance and environmental disclosure (Al-Tuwairji et al., 2004; Clarkson, et al., 2008 and Lopez-Gamero et al., 2010).

Regarding the external processes, two out of four small sized companies seem to be more environmentally conscious regarding the use of environmentally friendly transportation and eco-labeling and packaging. This reflects an extended commitment to a sustainable supply chain. The results also show a positive extension of external environmental practices to include building collaborative relations with customers and suppliers.

Most of the results show a positive relationship between environmental management practices and environmental performance and further support evidence provided in literature ((Zhu & Sarkis, 2004; Claver et al., 2007 and Testa & Iraldo, 2010). Thus, a good environmental management translated in sound environmental practices can help in identifying potential eco-efficiencies and make ground to improved environmental performance.

5.1.2. Environmental certification

Although not all companies surveyed have ISO certification, however, they all operate under numerous standards such as ISO 9000 and NORSOK S-006. ISO 9000 is concern with quality standards, while ISO 14001 is concern with environmental management systems. The

interviews conducted show that certification is treated as a strategic necessity mandated by the customer's demand, imitating the competition, and mandate by regulation.

“Our customers ask us for a proof of certification to see whether we are in compliance...”

“We know that our two big competitors may be certified, so we have to see what the value is and what the market requirements are.”

The results of this study support the findings in Poksinska et al. (2003) and Gonzalez-Benito & Gonzalez-Benito (2005) that certification is driven by competitive motivation to improve market position and as a formality label to overcome international trade barriers.

5.2. Environmental Commitment

5.2.1. Benefits envisaged

Companies normally act in response to stimulus that are driven by profit opportunities. Such opportunities can influence the level of environmental commitment and subsequently the environmental performance.

The results indicate that corporate image, legislative compliance, and customer demands are the most stimulating potential gains for an environmental commitment. The results also confirm that competitiveness reflects the environmental specificity of markets that stimulate the need to innovative technologies, solutions, and processes in order to meet the market expectation. This holds true with the technological and green innovation arguments expressed in literature (Geffen & Rothenberg, 2000; Zhu, & Sarkis; Hervani et al., 2005; Vachon & Klassen, 2007; Simpson et al., 2007). The results also confirm that the environmental commitment of companies is driven by strategic necessities expressed by imitating the behavior of the competition. These results are consistent with findings in Molina-Azorin et al., (2009) and Testa & Iraldo (2010). Environmental regulations present an institutional pressure that mandates responsible behavior. Complying with environmental regulations is also tied to the desire to reduce environmental risks. Therefore, quality is regarded as an essential performance criterion. The results also confirm that pursuing quality can result in cost

reduction and increased efficiency. These results are consistent with findings in Sarkis (2003), Khalid et al., (2004) and Zhu & Sarkis (2007), Lee, (2008), and Testa & Iraldo, (2010).

5.2.2. Organization's goals and the environmental management system

The quality of environmental practices can be assessed based on the company's objectives and its commitment (Schaltegger & synnestvedt, 2002). A proactive commitment to high environmental performance does have to be based on external pressures. Tomer & Sadler (2007) argue that high performing companies do not need penalties to prompt them to high environmental performance because they are already internally committed and motivated. The results in this research indicate that companies surveyed are not lacking commitment to the natural environmental, as expressed during interviews:

“Regulation can pressure companies but cannot produce the same results, as when companies recognize their ethical responsibilities and be proactive”.

“It is not due to regulation pressures. It stems from the company's vision, the need to preserve dignity and reputation, and our conscientious belief that we need to bare our share part of responsibility towards a sustainable future.”

Commitments are expectations and they form the basis for actions, therefore, they are inherently goals (Tomer & Sadler, 2007). For companies to have an effective environmental management system, they need to develop clear environmental goals that mark the specific targets and objectives of the company. Consequently, the relevance of goals is reflected in the way they are implemented, and the extent of environmental efforts exercised and awareness initiatives carried out. The results reveal that companies surveyed have relatively a strong of environmental commitment. Such commitment is embedded in the corporate strategies and goals, and disseminated internally through environmental policies. The results also show that the size of the company has no significant bearing on the level of environmental commitment. Managers interviewed claimed that their actions are guided by the goals set by high management and thus, the outcome reflects the actual commitment to those goals:

“...it all depends on what the goal of the company is and how do we want to present ourselves in the market and show the value of all we do.”

“.. the outcome reflects our commitment to the goals and priorities set by management.”

It is often perceived that the formation of an environmental unit demonstrates commitment to environmental issues. However, this is not sufficient evidence if it does not have the commitment of top management. All companies surveyed have a 'Quality, Health, Safety, and environmental' (QHSE) unit. However, the focus seems to be more on quality, safety and health with little focus on the environment. The companies' quality goal is fixated on high product quality and high productivity and not much consideration is given to the fact that environmental quality is also an outcome of how the system as whole works. Although, the majority of the companies surveyed portray high environmental commitment, they do not seem to exert sufficient efforts in practice as expressed during interviews:

"...we have systems in place to control chemicals for example but we do not use them because the focus is on different side."

"...whether it is just a matter of paper exercise or it is about really being an environmentally friendly company; in this regard, I know that we are not focusing much on the environmental side."

The TQM philosophy seeks to continuously improve all systems and processes through emphasis on quality in design, prevention of defects, and achieving optimal life-cycle costs (Mezher & Ajam, in Sarkis, 2009). However, Tomer & Sadler (2007) argue that the ideal goal is to include the environmental element in the TQM to ensure a total quality environmental management (TQEM). To understand better the environmental functions of the QSHE units and how much the quality system takes into consideration the environmental issues, interviewees were asked whether the quality have any environmental aspect. The feedback explained that quality is driven by customer demand and the need to minimize the environmental risks:

"... frankly it is because our clients are very focused on safety that is why we do not focus much on the environmental aspect."

"Quality is an important element in what we do because we need to make sure that the product is able to survive the under water conditions and that it is not pollutant to the environment, so design and durability are also part of the quality"

Based on the declarations above, interviewees were asked whether the environmental strategy of their company is merely a statement and whether the strategies do not have much room to focus and improve the environmental performance. Their answers revealed that the environment ranked low on the priority scale, therefore, supporting furthermore the argument

that a true commitment is central in setting priorities and guiding the focus to achieving environmental performance.

“We are like all companies concerned about the environment but we don’t show it in the way we want to and there is one reason and that it is prioritization.”

“... it is always up in the discussion, but we always say that we have to first make sure that the quality is taken care of, the safety is taken care of and then the environment will be taken care of.”

“Safety health and environment is a big thing for us, but the main focus we have in everyday business is the human factor.”

Feedback from interviews also provides evidence that companies manage the reputational risks and liabilities for environmental damages by focusing on improving the quality of their products and services. Thus, they are able to deliver the legislative compliance at a lower cost.

“We have to focus on quality because a disaster such that of the Gulf of Mexico can cost us our reputation in the market.”

Interviews also revealed that the functionality of the QHSE units is also challenged by time constraints attributed to the lack of sufficient human resources capacity. The skeleton staff on board that is often is represented by one or two persons have to attend to all four elements of the QHSE. Therefore the need to prioritize the environmental issues and separate the functions of the QHSE in order to give the environmental aspect more focus was voiced in the interviews:

“... environmental issues need to be upgrade higher up on the agenda like the safety part, and QSHE need to be broken down in order to have independent focus on environmental issues.”

Although results indicate that companies have environmental policies in place, the interviews revealed that those policies are not well communicated through some companies due to the inadequacy of internal systems to disseminate information. The inadequacy of the systems and the unavailability of a data base that contain commodities profile makes it difficult for procurement and QHSE staff to properly control for environmental matters:

“There is always an internal barrier because it is difficult to get the system known and to get people take ownership and that is why we face challenges in the daily work.”

“Our challenges start internally getting information from all the product managers, to list up what kind of chemicals there is in the product for example”

5.2.3. Commitment and investment decisions:

Environmental commitment is often affected by demand driven markets and their prevailing environmental criteria. Thus, fulfilling these commitments will involve the use of resources. Consequently, this has an impact on direct investments decisions to acquire strategic resources. These decisions are viewed by Johanson & Vahlne (2003) as a commitment to develop the firm's environmental position in the market. Companies surveyed portrayed high commitment to investing and developing their environmental resources and capabilities in order to respond to customers and market demands. The results support findings in Tomer & Sadler (2007), Lenney & Easton (2009) and Gavronski et al. (2011), that the commitment and support of top management is pivotal for the development of environmental capabilities.

5.2.4. Suppliers' selection and monitoring

Testa & Iraldo, (2010) argue that the position of the company along the supply chain can influence the adoption of environmental practices. To this end, primary customers can have an influence on the environmental behavior of their suppliers. This involves the act of conducting commitment in others and it depends largely on the level of involvement with the others, as well as, the degree of power exercised to persuade others to follow a particular course of actions (Lenney & Easton, 2009). Suppliers can be pressured through the selection process. The results show that companies focus on certification as a signal of compliance with the regulation. However, the credibility of this certification was voiced during the interviews. Interviewees are of the opinion that while a supplier can be certified, this does not constitute a guaranty of a good environmental performance. Similar observations were made in Poksinska et al. (2003), Henri & Journeault, (2008), and Lee et al. (2009).

“... certification is generic and is not sufficient, therefore, we expect suppliers to be forthcoming with facts about their environmental compliance.”

“We ask if the supplier is certified according to ISO 14001, though, we don't believe much that this certification is a good definitive measure. For example ISO certification in the US is not the same as that in Brazil, China or Taiwan. Suppliers, though certified, will perform differently in each location.”

The results of the survey questionnaire show that relevance of the supplier's process management relates only to environmental risks such as spillage, leak and pollution. However, when crossing these results with input received during the interviews, the correlation of relevance is reduced. Interviewees indicated that when it comes to where the responsibility of the business start and where it stops, they have no jurisdiction or means to measure for actual efficiency in the use of resources, pollution, and recycling. This was also evident in the manner they conduct site inspections:

".. we cannot go and say, according to the environment you should do that. We simply don't have indicators for our suppliers in this respect."

"During sites visit, if we see that it has a lot of rubbish we ask about their waste system."

"When it comes to health and safety of our people and their people, we are very strict; but we do not have environmental inspectors as part of those audit teams."

Conducing commitment can also be achieved through regular evaluation activities and continuous monitoring. Large & Thomsen (2011) argue that such activities are likely to see positive changes in how suppliers handle the environmental issues. The analysis reveals that companies are engaged in modest monitoring. This is attributed to the large number of suppliers. Consequently, attention is mainly given to the primary suppliers and those that are producing custom-made equipment. The level, mode, and frequency of these activities varied between the firms whereby some are engaged in regular evaluations and monitoring while others relied on project monitoring and evaluation:

"... Too many suppliers, therefore attention is given to primary suppliers and those producing tailored equipment; those are evaluated on regular basis and none performers are usually dropped"

"Normally we do about 8 to 10 audits a year on our big suppliers and we audit their quality system."

"Project environmental aspects are included as a part of our risk and opportunity reviews that is carried out regularly."

A true environmental commitment can lead to a spillover behavioral effect, because leading by example can influence the behavior of suppliers, partners, and competitors in the market. Such spillover can be transmitted through wider monitoring activities. Lee and Klassen (2008) found that monitoring provide a synergetic effect that can accelerate the development of the supplier's environmental management capabilities. The results show that such synergetic effect

is reduced due to time and capacity constraints that hinder companies from engaging in wider monitoring activities.

5.2.5.1. Environmental indicators

Using indicators constitute a fundamental dimension of any selection or information system (Henri & Journeault, 2008). Therefore ensuring attainable environmental objectives require a set of reliable environmental performance indicators (EPIs) for assessing and selecting suppliers. When interviewees were asked what kinds of indicators are used for the selection of suppliers, they indicated that they have no particular indicators pertaining to the environment and that they rely to some extent on NORSOK S-0006 as a guiding document:

“We do not have any indicators that pertain to the environment. We use NORSOK S-0006 when we select and audit suppliers... normally, we check if they deliver according to contract and price but we do not ask what they do environmentally on their side.”

“Before suppliers are selected, they are assessed through a standards questionnaire that is based on NORSOK Standard S-006. We also conduct a visit to the facilities.”

“No EPI’s, but we prefer suppliers with ISO 14001 certificates or at least those that can show they have environmentally sound practices.”

NORSOK S-0006 focuses on safety and health, whereas the environmental requirement is phrased in general terms. Thus, this explains the divergence of companies’ focus to health and safety. In the absence of clear guidelines and indicators, resolving the issue of environmental responsibility represent a challenge for companies to establish the acceptable extent of the supplier’s compliance with environmental regulations. This is further complicated by the different application of these regulations across countries. Therefore, including an environmental perspective to the generic requirements of the supplier performance selection is imperative in establishing green selection criteria. Quality is dependent on product characteristics and measured by the durability, reliability, and the ease of use and disposal. Therefore, the environmental dimensions of these measures, established through the product characteristics are essential in establishing environmental indicators for the suppliers’ selection. Within these parameters a set of environmental indicators were tested for relevance. The results confirm the correlation between the product characteristics and quality. The ability to adjust production and responsiveness to green requirements are also viewed as imperative.

A random question that was suggested by NODE related to what is perceived as important indicator was asked during the interviews. Some thought that indicators should measure the foot print of the production process, in addition to considering recycling efficiency and the deposition of the product. Reflecting on their sub-contractors, others thought that pollution and chemical handling are very important, while one thought the presence of a viable environmental management and environmental accounting systems are important indicators of a supplier environmental orientation and behavior. Responses are in correlation with tested environmental indicators in this thesis.

“.. they could be divided into 2 parts. One part being the environmental foot print of the production process, say, if someone produces a drilling machine for us, what kind of a foot print they make there. The other has a life cycle foot print and how good are we at recycling the unit produced and how much of it goes to the dump or the steel melt.”

“... thinking of our sub-contractors, pollution is important, and chemicals handling and all that relates to them..”

“... having a good environmental system, and if they have an environmental account system.”

Handfield et al. (2002) propose integrating the Analytic Hierarchy Process (AHP) into the purchasing process as a tool that can help in the supplier's evaluation and selection decisions. The system aggregates the different criteria in order of relevance and preference to produce an environmental performance index for each supplier (Handfield et al., 2002). The assimilation of such information into a database that can be accessed by the relevant purchasing managers, engineers, and production managers will facilitate the selection and monitoring process. It will also aid the QHSE managers in their monitoring activities.

Supported by empirical evidence, the results show that proactive environmental commitment has a direct influence on setting goals and priorities (Lenney & Easton, 2009; Tomer & Sadler 2007). The results also provide evidence that environmental commitment positively influence the development of resources and capabilities. It also influence supplier assessment and selection process, in addition, to providing for a synergetic effect in greening the supply chain (Bowen et al., 2001; Large & Thomsen 2011, Kannan, 2002). Hence, environmental

performance is positively associated with the level of environmental commitment and that support the first proposition.

5.3. Resources and Dynamic capabilities

The firm resources and capabilities are essential mediators for implementing best environmental practices and achieving high environmental performance. The results of the study show that most of the companies surveyed have sufficient base of resources and capabilities to effectuate a good environmental performance. However the availability of the resources varied between the companies. Two of the small companies seems to lack innovative technology, while one of the big companies is lacking sufficient resource base necessary for gaining environmental competitive advantage. Building a resource base is often realized through cooperative agreements with other firms or the acquisitions of complementary firms, as is the case with the most of the companies surveyed. The results also show some degree of collaboration for the purpose of acquiring complementary access to external resources. The level resources and capabilities is found to be in correlation with the commitment to invest in developing environmental capabilities. The correlation explains the need to develop resources and capabilities in order to position themselves as leaders in the international market for energy production, systems, and services.

“...of course, we produce big equipment and specialize in turnkey solutions and so to remain leader, it is not an option, we need to always develop our resources and technologies...”

A firm's internal capabilities are key determinants for its environmental performance and how it responds to opportunities it confront (Tomer & Sadler, 2007). These capabilities are important for effective functionality of the firm's EMS system. Knowledge as a resource is important in effecting changes. The findings express a need to invest in developing the human capital. Accordingly, a good base of tangible resources would require reinforcement through capacity building programs and training. The need for training and capacity building in environmental management was repeatedly expressed during interviews; as such, knowledge would facilitate good practices and boost the capacity of the QHSE units.

The findings conform to empirical evidence that strongly associates the level and type of capabilities, such as technology, processes, skills, and top management commitment with

environmental performance (Christmann, 2000; Tomer & Sadler, 2007; Lopez-Gamero, et al., 2009). The results also confirm the findings in Judge & Elenkov, 2008, Lopez-Gamero, et al., (2009) and Reuter et al., (2010) that proactive investment in developing valuable resources and capabilities improve the environmental performance of the firm and increase its competitiveness in the market. The findings also conform to empirical evidence that relates the availability of internal resources to the consideration of potential environmental options (Menlyk et al., 2003 and Menguc & Ozanne, 2005). Hence, a positive relationship is anticipated between the accrual of innovative resources and capabilities and environmental performance. Consequently, the findings support the second proposition that environmental performance is positively associated with the level of resources & capabilities available at the firm.

5.4. Environmental collaboration

Internationalization and the increasing change in markets environmental requirements, present high pressure on companies with inadequate capabilities to remain competitive in a very competitive global environment. Therefore, empirical evidence suggests that collaboration is considered a resource that is required to enable firms complement their knowledge and capability base through differential access to external resources in order to realize better environmental performance and respond to customer environmental requirements. (Vachon & Klassen, 2006; Arya & Lin, 2007; Simpson et al., 2007; Azevedo, et al., 2011; Cheng, 2011 and Large & Thomsen, 2011). The results reflect a moderate collaboration for the purpose of complementing resources and capabilities. This may be explained by the availability of sufficient resources and capabilities at the firms' level. It is also attributed to a high level of outsourcing activities, and the effectiveness of 'in-house' resources transfers among the MNCs.

Studies provide evidence that collaboration does not only occur for the purpose of upgrading resources profile but also as a way to establish a status affiliation, which in turn can provide companies with expanded access to distinctive markets (Arya & Lin, 2007). Authors further suggest that collaboration is usually strong between companies that enjoy strategic similarities and subjective measures of collaboration outcome. Such collaboration was moderately evident under consortium agreements involving two of the firms surveyed that involves joint

technology development and joint production. The results in this research complement those reported in previous studies. For example, Geffen & Rothenberg (2000) provided evidence of collaboration in the form of joint planning activities, Klassen & Vachon (2003) found that collaboration is positively linked to the selection of pollution prevention technologies, Bowen et al. (2001) and Zhu & Sarkis (2004) found that collaboration can have a positive impact on product and production processes.

Johanson & Vahlne (2003), argue that firms develop close interdependencies in relation to the important partners, be it a major customer or supplier, and they are usually prepared to defend those relationships through increased commitment and collaboration with those firms. Consequently, they develop common environmental goals, supported by a common interest in the future development of innovative technologies and skills (Johanson & Vahlne, 2003 and Vachon & Klassen, 2006). While results show a certain degree of collaboration in setting environmental goals, they also show that collaboration is conditioned by the customer's requirement. Consequently, the level of collaboration is significant by the degree of the relationship conditions. Thus, the significance of the customer-supplier relationship depends on the environmental commitment it carries (Simpson & Power, 2007).

The moderate level of collaboration can be attributed to the inherent relational risk. Subsequently, collaborative relations are influenced by the relational benefits they represent. Cheng, (2011) argue that relational benefits are crucial in determining the level of commitment in the relationship. Studies suggest that environmental collaboration is time and resource demanding process, however, it facilitate experimental knowledge development. Acquiring knowledge is a time consuming and costly tasks that companies tend to forgo by grafting knowledge through others (Cheng, 2011). Nonetheless, the results obtained reflect different reality. Sharing environmental knowledge and know-how does not factor in the collaboration. This is attributed to the mistrust and conflict inherent in knowledge sharing. Therefore, when it comes to knowledge, collaboration often requires restructuring the firm information boundaries. Feedback from interviews suggests that resources and information exchange tend to diminish beyond the boundaries of the firm:

“... we know the more we focus and collaborate with our suppliers, the more they focus on environmental performance, but we have to be careful with what we share.”

“... we also know that our suppliers are also our competitors’ suppliers and of course there is a sort of understanding that you don’t share information between the competitors.

“We are protective of our systems, so I don’t think we have that kind of exchange outside our companies.”

“... only within our companies, we do share resources.”

Effective collaboration generally requires a greater degree of trust among partners. Cheng, (2011) argue that dependent relationships are characterized by power asymmetry and potential opportunistic behavior. Consequently, the lower is the level of trust; the lower is the level of collaboration. When firms share tailored or condition specific collaborative tasks, sharing knowledge is inevitable, therefore, despite the benefits envisaged from the task, companies find themselves forced to set sharing boundaries in order to protect themselves against knowledge appropriation. Thus, knowledge protection impeded knowledge sharing between organizations (Cheng et al., 2008)

The result in this study emphasis more collaboration with the customer than with the supplier. This is attributed to increase responsiveness to customer’s environmental concerns (Azevedo et al., 2011). It also relates to the product specification, in regards to the conditional quality requirement, reliability of deliveries, the flexibility to adjust the product mix, and the financial liabilities embedded in contracts. This correlates with findings in Vachon & Klassen (2008) that collaboration with customers is more prompted by product-based quality and environmental issues, which are found to be positively linked to better environmental performance (Vachon & Klassen, 2006).

The results show that environmental collaboration is exercised to the extent it does not compromise competitiveness, that it is more related to custom-made production, and emphasis more collaboration with customers to prompt better environmental performance. Consequently, environmental performance improves by the degree of environmental collaboration and this support the third proposition.

5.5. Environmental regulations

Environmental regulations are considered strong moderators for regulating environmental performance. Companies in high polluting industries are often under great pressure regarding the environmental aspect of their activities and their supply chain, thus, they tend to pass

those environmental requirements to their suppliers in the supply chain (Handfield, et al., 2005 and Nawrocka et al, 2009). The results show an overall favorable perception of the environmental regulations, mainly emphasized in market opportunities. The results also portray high commitment towards protecting the environment demonstrated in the ability of the firms to consolidate business demand and the environmental requirement demands. The finding support empirical research existing (Ivens, 2005; Vachon & Klasse, 2006a; Darnall, 2006; Subramoniam, et al., 2009; Nawrocka & Parker, 2009).

5.5.1. Complexity of the regulations

One might argue that the failure of implementing the regulations appropriately is because they are perceived complex and difficult to translate into standard operating procedures for the use in daily activities. Interviewees complained that there are too many regulations and too little guidance. They also complained that regulations do not provide clear delamination of responsibilities and that performance indicators are generalized and vague or too cumbersome to translate into actions. This is particular true when it comes to suppliers' selection and having proper environmental disclosures. Similarly, Spence (2001) confirm that firms find it difficult to comply with the regulations because of their complexity and environmental situations, therefore, firms tend to follow a conventional approach to avoid penalty, which is counterproductive and undermines the legitimacy of the regulatory system. Metzenbaum (2001) further argue that the broad application of ISO 14001 as a tool is rather unclear and does not facilitate achieving the policy goals. Comoglio & Botta (2012) also note that the regulations do not provide guidance in the design and use of environmental performance indicators, nor it does suggest explicit monitoring procedures and measures. Subsequently, there is a need to homogenize all the different sets of regulations under one formal international standard instead of following too many different standards, as is the case now. In addition, there is a need to clarify the environmental requirements by devising clear, attainable and measurable indicators and by designing guiding procedures for evaluation and monitoring. Further, firms in highly scrutinized industries should have clearer standards that reflect the environmental norms of the industry and provide proper guidance that is geared towards the specific issues in the industry. Proper training and competency development at the level of the industry and the firm should also complement the standard regulations. In addition, providing companies regularly with updated information on pressing environmental problems and potential solutions can help a

better understanding and application of the regulations and achieving in higher environmental performance (Jaffe et al., 2002).

“There is a lot of information but it is a challenge to have them written as standards of procedures to use as part of our work days.”

“I think they should put some resources in implementing them in business life because it is not enough to revise the documents and conduct meeting and workshops.”

5.5.2. Differences in regulations and implementation

The difference in the regulations requirements, implementation and measures applied can vary greatly from one region to the other. Rothenberg et al. (2005) attributes the differences to the complexity of the process and the lack of resources, expertise and emission rate information in some countries. Differences in the application of environmental regulations create a challenge for companies when evaluating and selecting suppliers. This issue was sharply noted in the interviews. While environmental requirements may be stricter in Norway, they tend to be more relaxed in other regions. Thus, the regulations paradox is replicated in the environmental requirement of the customers. Customers of the North Sea are noted to have different environmental focus and requirements than those in other locations. Consequently, when operating or producing an equipment to be used outside the national borders of Norway, for example, companies tend to behave in accordance to the prevailing norms in the foreign location. This is justified as the need to preserve competitiveness. This behavior reconfirms the notion that certifications of compliance are merely an administrative requirement. Therefore, the different application of environmental regulations between the countries affects the level of environmental performance of companies and affects their competitiveness as well.

“... for example, if our main focus was Vietnam or any other 3rd world country, their focus is not as high as the one in the North sea countries in regards to the environment and HSE.”

“... it is about the competitive edge. It will be disadvantageous for us if we start acting more strict than our competitors because it will drive the cost up.”

5.3.3. *Requirement for tighter control*

Relying on self-regulating approach may not be sufficient due to the lack of ample wiliness to commit. Interviews clearly indicated that commitment lies where there is control, therefore, companies focus on the business areas and on locations that are subject to stronger control. Consequently, interviewees acknowledged that their companies could do better if there was a tighter environmental control.

“It is true that the Norwegian law say we have to do this and that but they don’t control us so it is easy to let that focus go and focus on the sides where we are controlled regularly.”

“If we are to deliver a product to Brazil for example, we have to have special measures to avoid any drop of spill in the ocean because the regulations there are very strong.”

Markets react to demands. Similarly, suppliers respond to customers’ requirements. During the interviews, companies stated that the selection of material and solutions is tied to cost restrictions applied in contracts. The focus of the customer is mainly on functional quality and not the environmental quality, in the sense that the systems are safe, reliable and functional. This logic seems to apply across all the companies interviewed regardless of what kind of certification they had.

“... our technology is used within the limits of the client contracts and specifications and has cost restrictions. This means that we most often do not have the freedom not to select systems that from our side are perceived as not the best choice.”

“Using superior material that is environmentally treated/compliance is usually costly. The problem is that the customer often looks at the cost and favors the reduced price, which makes it difficult to us.”

For the regulations to achieve its objectives there should be more emphasis on the environmental quality in products, services, and processes. Companies, claim that existing regulation allow for the use of environmentally friendly material, however, regulations do not stipulate the mandated percentage of free harmful agents. Therefore, companies consider themselves compliant according to regulation, as long as they have fulfilled the minimum requirements and declared the content of the product. Comoglio & Botta (2012) also note that

existing regulation does not fix the minimum levels of environmental performance that merit renewal of certification.

“... nothing says that we have to go for the most environmentally friendly but it says we have to declare the contents of the product ...that is also if you are ISO 14001 certified.”

Therefore, if the regulations are applied with tighter control, they would yield better results. Tomer & Sadler (2007) explain this as a bargaining process between the industry and the regulatory bodies whereby the environmental performance is an objective determined collectively. Consequently, when the environmental regulations are clear, guiding, and adequately controlled they will positively stimulate a commitment and affect a better environmental performance. This support the forth proposition.

5.6. Incentives

In theory, incentive-based approach has the same moderating effect as environmental regulations. However, literature provides evidence that businesses are usually more responsive when rewards are tied to expected benefits.

Often, the decisions regarding the magnitude and nature of the firm's activities and efforts to maximize the environmental value are affected by the presence of cash flows (Jaffe et al., 2002). For example, it is usually difficult to finance R&D through capital market mechanisms because of the high uncertainty that surround the probability of potential high value outcomes. Firms that are not able to develop their capabilities cannot be expected to be self-regulating (Tomer & Sadler, 2007). Therefore, environmental regulations should be adequately supported by incentives to encourage innovations and maximize the value of environmental performance.

Incentives allow firms to adopt pollution-control technologies and reduce the cost of compliance on the long run, therefore, an incentive-based approach works by making environmental sustainability more affordable, and profit generating activity (Jack et al., 2008). Environmental regulations do not reward companies for being environmentally responsible; therefore, companies do not go beyond compliance. Incentives, on other hand, are powerful motivators for companies to exceed emission control targets and go beyond compliance (Jaffe et al., 2002). Consequently, this provides an argument for incentive and rewards backed

regulations and not just the establishment of just more stringent controls. Financial incentives in the form of market-based instruments are viewed to be very important because they provide companies with means to develop innovative products and processes, as well as the leverage to invest in complementary resources and capabilities. Market-based instruments are seen as very helpful in promoting environmental competence. This is supported by similar findings in (Jaffe et al., 2002; Tomer & Sadler, 2007). A motivation approach is usually taken at face value, consequently, rewards are perceived as an appropriate outcome for a high performance (Bresnen & Marshall, 2000). Interviews revealed a strong conviction towards reward and incentives systems:

“It would help the total environmental efforts when companies that show good environmental performance, are rewarded. “

“... it depends on what you get back because it is always a cost issue; so if we get incentives, if the government will give us something back, then yes this will make it more interesting.”

Another argument put forth relates to the relationship between environmental efforts and competitiveness. Therefore, if companies are to uphold high environmental performance and stay competitive in the international market, an economic incentive is a strong tool to motivate continuous environmental improvements (Schaltegger & Synnestvedt, 2002).

“It is about the competitive edge. It will be a disadvantageous for us if we start acting more strict than the rest of the businesses (competitors) then we have a problem because this will drive the cost up.”

Incentives can be applied in different formats. For example, incentives in the form of technical assistance would help companies build and strengthen their environmental capacities. Such assistance was recognized in the survey as an element of knowledge required to enhance the environmental management and performance. QHSE units have the responsibility to guide and monitor performances. However, the lack of attention to human resources training and development can undermine the importance of the environmental management systems and affect the overall environmental performance of the company. Therefore, building capacities through training programs can aid the environmental management systems of the companies (Tomer & Sadler, 2007) and help managers do their job more efficiently.

“...need to take more responsibility in teaching and in competence development.”

“... company experience pressure because demand for environmental requirement is growing and it is really hard to follow up with all the changes, that is why the government need to do better in providing information and education about all these changes, because when we have this, we will defiantly do better.”

The Nitrogen Oxides (NOx) Fund was proposed as an incentive. The NOx Fund is a voluntary agreement between the government of Norway and various industry associations such as the shipping, offshore oil and gas producers, and fishermen's associations. Accordingly, companies pay a participation fee to the NOx Fund instead of paying NOx taxes while implementing environmental measures to reduce emissions. NOx Fund members can get financial support for projects intended to reduce the NOx emissions (nortrade.com).

5.6.1. Suppliers' development programs and incentives

The results reflect a positive view regarding the importance of suppliers' incentives in promoting a better environmental performance. Simpson & Power (2005) found that supplier incentives are key enablers for supplier development efforts and send a motivating message to suppliers that improved performance is rewarded with increased business and preferred status. However, the preferential treatment, as explained by the interviewees, is not exercised explicitly as an incentive for better environmental performance; rather it is a natural outcome of the supplier selection process exercised by the companies. Pagell & Wu (2009) argue that supplier's incentives can reduce the supplier's risk from engaging in a new collaborative process. This is true to an extent, as it depends on the purchase power of the customer and the availability of a strong customer base as a supplement for the trade off- between high environmental performance and preferential treatment. Bresnen & Marshall (2000) argue that relying mainly on an incentive system as a source of motivating collaborative ventures tend to be characterized by short-term self-serving economic interest. Although this argument merits some truth, the rational pursuit of business is based upon calculated benefits. Thus, one can argue that suppliers' incentives are useful in reinforcing a calculative trust and fostering a deeper level of environmental commitment.

When buying firms encounter shortcoming in the performance of their suppliers, they usually search for alternative supplier (Large et al., 2011). This can be costly and time consuming. Therefore, Handfield et al. (2000) suggest that the buying firm undertake activities that would help the supplier meet the environmental criteria of the buying firm. Those activities include

supplier assessment, providing suppliers with incentives to improve performance, and working directly with them through training programs. While companies practiced indirect incentives through the supplier selection process, none of them were having specific environmental programs outside the scope of contracts. Subsequently, a risk-reward formula is applied based on the assessment indicators that focus on the cost, quality, health, and safety criteria. Humphreys, et al. (2004) found that supplier' development effort entail complex activities such as training, workshops, site visits, mentoring, and consultancy support, thus, a long-term commitment is a prerequisite for such involvement. Therefore, while voluntary environmental programs are regarded as complementary tool to motivate suppliers to have proactive environmental management systems (Rivera & Delmas, 2004), they require a strong sense of commitment of both buyer and supplier. Consequently, incentives positively strengthen the relationship between environmental commitment and environmental performance and that supports the fifth proposition.

CHAPTER SIX

CONCLUSION AND IMPLICATIONS

6.0. Introduction

This chapter presents the conclusion drawn from the research questions and findings. The chapter also highlights limitations encountered and makes recommendation for future research

6.1. Conclusion

The purpose of this study is to test the path process between the different variables in the model presented. The path process helps in establishing the connection between the variables and offers an insight on the state of environmental performance in the supply chain of oil and gas industry, in Southern Norway.

The study demonstrates that a proactive attitude needs to be reinforced with tangible commitment to environmental performance. However, such commitment can be effective if it is aligned with the business environmental strategy and objectives. The study demonstrates that the environmental aspect is not afforded the right priority and the focus of the QHSE units is on quality, health and safety. Thus, it is important to separate the functions of the QHSE unit in order to attend to environmental issues in a more efficient manner.

A proactive environmental management requires incorporating environmental issues into purchasing strategies, which are linked to material management, product characteristics, and the supplier evaluation and selection process. A green supplier is expected to go beyond the certification of compliance and be efficient in green product design and life cycle activities. The results show that environmental criteria do not have much weight in the supplier selection process. On one hand, this is due to absence of clear guidelines and indicators forging an issue of environmental responsibility. On the other hand, it is related to maintaining competitiveness in unequally regulated market. The results also confirm that certification is not a sufficient proof of environmental performance. Therefore, including an environmental perspective to the generic requirements of the supplier performance selection is imperative in establishing green selection criteria. The study also reintroduces a proposal to consider the

AHP system as a decision tool when integrating environmental criteria in the supplier selection and monitoring process. A good selection system can help reduce environmental risks associated with suppliers while increasing the environmental performance and competitiveness of the firm. Proactive environmental commitment can also provide a synergetic effect through monitoring activities. Consequently, the study reinforces the need for a true environmental commitment to bridge a path for a high environmental performance.

Companies develop their resources and capabilities in response to internal stimulus such as top management commitment and external stimulus such as market pressure, regulations and competition. The findings confirm that the firm's valuable resources and capabilities can have positive effects on environmental performance outcomes. Thus, a specific advantage can be derived from innovative environmental resources that are relevant in capturing opportunities and maintaining a competitive advantage.

The study shows that environmental collaboration is task specific and is mainly associated with custom-made equipment. It is also more linked with quality performance. Collaborative behavior with suppliers and customers would normally induce a proactive environmental performance on both sides. However, the results indicated more collaboration with the customer than with the supplier. This is attributed to the perceived financial and operational benefits that are likely to be generated from such collaboration. Therefore, relational benefits increase the commitment to collaborate. On the other hand mistrust and conflict arising from knowledge sharing tend to minimize the attractiveness of collaboration. Consequently, the environmental collaboration is exercised to the extent it does not impend competitiveness.

Companies will not spend more on environmental issues than is required to comply with regulations while maintaining economic goals. . Therefore, environmental quality can only be ensured through environmental regulations. Companies pursue certification as a matter of legalization, thus certification is becoming a de facto requirement for doing business. However, regulations are seen as numerous, complex and generic. Consequently, there is a need for clearer standards that are geared towards industry specific issues. Self-regulating may not be sufficient as evident in the results. The study shows that companies focus on areas that are subject to more controls, thus the need for a better control to ensure better environmental performance.

Command-control regulations do not reward firms for good performance. Consequently, this provides an argument for incentives backed regulations. In general, governments can have significant influence on the adoption of green practices, compliance and reporting. An active government role through routine eco-auditing, stronger regulations and mandatory reporting can help create an even playing field for companies to compete on equal terms, and support the availability of transparent and comparable environmental information. Thus, a stronger government role can complement the environmental monitoring and tracking made by buyers and suppliers in the supply chain.

The study emphasizes the importance of incentives in motivating behavior and support the argument that incentives do reinforce commitment. Incentives can be applied in different formats such as market incentives, technical assistance, training, and development programs. Therefore, motivation and commitment hinges upon the context of the incentive systems. Incentives help companies preserve their competitiveness in the international market without compromising their sustainable performance. Therefore, it is important to design incentive systems that complement and support environmental regulations.

Supplier's incentives are useful in reinforcing calculative trust and fostering a deeper commitment to a proactive environmental performance. While a risk-reward formula within the scope of the contract may be useful for controlling the supplier's environmental performance, companies need to invest more in supplier development programs. Such assistance can be made by providing consultative support, mentoring, and including environmental experts when auditing sites. Consequently, such programs can help suppliers improve their environmental management systems, especially those, that are located in relaxed control regions.

6.2. Implications and future research

Despite the different limitations, this research provides several important implications. First, it provides insights on environmental practices and their implications on the environmental performance of upstream first tier suppliers, and the efforts they make in greening their suppliers. Secondly, the study has a managerial implication as it provides managers with better understanding of the impact of green purchasing. Thirdly, the findings may have important

implication for policy makers and those concerned with environmental regulations and control.

6.3. Limitations

Despite the contributions, this study has some methodological limitations. First, although the sample is acceptable for this research, it is still very small and therefore may not be sufficiently representatives; therefore, I can only claim that the results are generalized to firms in the sample population and may not be sufficiently specific. Secondly, the findings are heavily influenced by the personal perception of the managers who participated in the study, thus there is the possibility of response bias. Second, it was not possible to obtain samples of questionnaires used in assessing and evaluating suppliers and the database systems used in the selection and assessing suppliers are not known to this study. Further, due to the non-availability of internal environmental management reports, it was not possible to crosscheck actual performance measures used in assessing the firms environmental performance. Thirdly, it is imperative to understand the differences regarding the link between environmental regulations, competitive advantage, and the degree of public visibility across industries. In addition, there is a need to consider the differences in internal competencies and external pressures, and the different configuration of stakeholders. Therefore, a future research can add more confidence to results obtained by replicating the study and ensuring that sample size and unit size is properly representative of the constructs investigated.

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Appendix I – Interview Questions

1. Organization

- a. What is your company's overall objective in the handling of environmental issues?
- b. How often do you conduct internal environmental audit? What does the measure entail? Do you have a company benchmark? What does the measure entail?
- c. Are you certified and under what standard?

2. Supplier selection and monitoring

- a. Is there any form of environmental performance ranking or benchmarking associated with selecting your suppliers? Can you name few? How does this evaluation affect contract awarding?
- b. Do you evaluate your supplier's performance on a regular basis?
- c. What environmental indicators would you have used differently that you think is more relevant and makes you different from your competition?

3. Resources and capabilities

- a. Does your company possess strong base of resources and capabilities?
- b. What is that you lack and need most?
- c. Do you consider yourself a powerful company within the industry? If yes, are you able to use this power to influence suppliers' environmental behavior? Are you exercising this power?

4. Environmental collaboration

- a. To what extent do you collaborate with your suppliers? And what is involved in the exchange?
- b. Do you think you can influence your customers' environmental behavior ?
- c. Do you collaborate more with your customers than your suppliers? If yes why?

5. Environmental regulation & reporting

- a. How does your company look at regulations, e.g. are they useful, helpful, do they affect your competitiveness? if yes how?
- b. Do you think if you are mandated to report on your environmental performance, you will pressured to do better?

6. Incentives

- a. Does your company has an inter reward system? And do you have any reward systems for your suppliers?
- b. Do you think if environmental regulations are tagged with incentives, they would yield better results? How and what kind of incentives do you have in mind?

Final

Is there anything else you would like to add?

Appendix II – Survey Questionnaire

The findings of this survey are intended to be used in a Master Thesis on environmental performance. The survey will be handled with total confidentiality.

Thank you for participating, it will take around 15 minutes to complete the survey.

Firm's Characteristics

Is your company part of an International corporation?

- (1) ☐ Yes, we are an international corporation
- (2) ☐ No, we are not an international corporation
- (3) ☐ Other _____

How many full-time employees does your company have in Norway?

- (1) ☐ Under 100
- (2) ☐ Between 100 and 249
- (3) ☐ Between 250 and 399
- (4) ☐ Between 400 and 599
- (5) ☐ Between 600 and 799
- (6) ☐ Between 800 and 999
- (7) ☐ Over 1000

What is your company's main activity? Please select the appropriate category.

- (1) ☐ Offshore drilling technologies/Machinery & optical equipment
- (2) ☐ Basic metal & fabricated metal products
- (3) ☐ Transport equipment & logistics services
- (4) ☐ Services
- (5) ☐ Engineering & project management
- (6) ☐ Coke, refined petroleum products and/or nuclear fuel
- (7) ☐ Chemicals and manufactured fibers
- (8) ☐ Rubber and plastic products
- (9) ☐ Electric products
- (10) ☐ Others, please specify _____

Firm's Environmental Commitment

Does your company have an environmental management department?

- (1) ☐ Yes
- (2) ☐ No
- (3) ☐ If yes, how many people _____

Does your company have ISO 14001 certification?

- (1) ☐ Yes
- (2) ☐ No

- (3) ☐ Certification in the near future
 (4) ☐ Certification is not considered
 (5) ☐ Have other certification, please specify _____

What drives your company to adopt environmental management? Please indicate by order of relevance.

	Not relevant	Minor relevance	Moderately relevant	Relevant	Very relevant
Reputation	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Legislative compliance	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Customer demand	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Environmental risks	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Competition	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Responsiveness to market expectations	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Cost reduction	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Quality	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Flexibility	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

To what extent is your company committed to environmental performance?

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
Our company has a clear policy statement urging environmental awareness in every area of the business.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Protecting the environment is a central corporate value in our company.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
At our company, we make concerted efforts to make every employee understand the importance of environmental management.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
In our company, we are committed to investing and developing our environmental resources and capabilities in order to	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
improve our environmental performance and meet customers' environmental requirements.					
We are committed to disseminating good environmental practices and sharing our environmental experience through close collaboration with suppliers and customers.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Environmental performance is only relevant to our company by the degree it affects our contracts with our customers.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
The suppliers' environmental performance is only relevant to us, by the degree it affect the product and service provided by the supplier.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

What are your major obstacles for implementing and improving environmental performance?

	Not relevant	Minor relevance	Moderately relevant	Relevant	Very relevant
Financial	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Technology	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Capacity	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Time	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Training	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Lack of environmental knowledge	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Time	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Lack of incentives	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Willingness and commitment	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Others	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Environmental Capacity Knowledge

What is your source of knowledge in relation to improving the environmental performance of the firm?

- (1) ☐ Consultancy
- (2) ☐ Suppliers
- (3) ☐ Customers
- (4) ☐ University/Research institutes
- (5) ☐ Government agency
- (6) ☐ Partners
- (7) ☐ Others, please specify _____

What kind of knowledge does the company need in order to improve its environmental performance and that of its supply chain?

- (1) ☐ Technical assistance
- (2) ☐ Training, seminars, workshops
- (3) ☐ Consultancy
- (4) ☐ Government co-operation
- (5) ☐ Other, please specify _____

Firm's Environmental Practices

In the last two years, the company has taken environmental actions in the following areas:

	Strongly disagree	Disagree	Neither	Agree	Strongly agree
Green purchasing practices	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Environmental collaboration with suppliers	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Environmental collaboration with customers	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Use of environmentally friendly material	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Use of clean technology	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Recycle/re-use of material waste generated by the company	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Use of alternative sources of energy	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Optimization of processes to reduce solid waste	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Optimization of processes to reduce water usage	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

	Strongly disagree	Disagree	Neither	Agree	Strongly agree
Optimization of processes to reduce noise	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Recovery of company's end-life cycle products	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Eco labeling and packaging	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Using more environmentally friendly transportation	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Support is given to new methods/ideas with the aim of identifying areas for environmental improvement	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Increase in environmental investments (technology, R&D, innovations, etc.)	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Clearly articulate and publicize environmental information on the company web-site	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Provide annual environmental disclosures	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Resources and Dynamic Capabilities

To what extent does resources and dynamic capabilities affect your environmental performance?

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
We have a strong financial base that allows us to invest and develop environmental capabilities easily.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
We possess innovative environmental technology.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
We are known for excellent environmental knowledge, know-how, and experience.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
We have excellent expertise and technical skills.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
We possess excellent organizational intelligence, creative management, and leading information technology systems.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
We have sufficient internal and external assets that	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
provide us with the necessary power base to gain environmental competitive advantage.					
We have the capacity to effectuate capabilities combinations in support of environmental responsiveness, quality, and flexibility.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
We lack strong base of resources and capabilities which pose limitation on our environmental performance.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
We complement our resources and capabilities base through our relationships and collaborations with our partners in the supply chain.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Environmental collaboration

In the process of greening the suppliers, to what extent has your company engages in the following environmental activities.

	Never	Rarely	Sometimes	Most of the time	Always
Invite suppliers to join in early product design & development	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Share know-how and environmental experience with suppliers	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
The environmental collaboration involves joint capabilities development, e.g. joint planning, joint technology development, joint production, etc.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Collaboration with suppliers to reduce/eliminate product environmental impact	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Provide technical support to primary suppliers to help them improve their environmental standards	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Provide consultancy support to primary suppliers to help them improve their environmental standards	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Helping suppliers to establish their own	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

	Never	Rarely	Sometimes	Most of the time	Always
environmental programs					
Our collaboration involves sharing environmental policies and goals	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
We collaborate more with our customers than our suppliers	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Is there any collaboration agreement in relation to technology transfer and knowledge exchange between your firm and other firms in your supply chain (e.g. pilot projects, demonstrations, etc.)?

Monitoring suppliers' environmental performance

In the past two years, to what extent did your company engage in monitoring the suppliers' environmental performance?

	Never	Rarely	Sometimes	Most of the time	Always
Sending our company experts to audit primary suppliers plants	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Requesting information regarding environmental compliance	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Conduct periodic environmental evaluation of our suppliers based on our company criteria	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Supplier selection

In the process of greening the suppliers, has your company exercised its power to influence the suppliers' environmental behavior?

	Never	Rarely	Sometimes	Most of the time	Always
Suppliers are selected based on environmental criteria	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Environmental criteria is not a priority in the selection	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Asking suppliers to commit to environmental actions and waste reduction	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

	Never	Rarely	Sometimes	Most of the time	Always
Our environmental requirements only relate to product specifications	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Require suppliers to obtain environmental certification such as ISO 14001	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Require suppliers to provide regular update on their environmental performance	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Generally, stipulate environmental requirements in the contracts awarding	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Environmental Performance Indicators

To what extent the following indicators are relevant in the selection of your suppliers? Please indicate in order of relevance.

Supplier's commitment

	Not relevant	Minor relevance	Moderately relevant	Relevant	Very relevant
Level of supplier environmental certification	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Number of supplier environmental initiatives	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Extent of supplier self-environmental monitoring	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Level of supplier environmental disclosure	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Availability of environmental reward or incentives systems	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Level of supplier pre-processing of raw material (removal of environmentally questionable components)	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Supplier's process management

	Not relevant	Minor relevance	Moderately relevant	Relevant	Very relevant
Level of process optimization for waste reduction	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

	Not relevant	Minor relevance	Moderately relevant	Relevant	Very relevant
Level of process optimization for air emission	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Level of waste generated during production	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Level of spillage, leakage, and pollution control	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Level of the supplier's cooperation in returning product at life end-cycle	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Availability of collection centers for products at end-life cycle	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Recycling efficiency	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Number of violations of environmental regulations	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Product's environmental characteristics

	Not relevant	Minor relevance	Moderately relevant	Relevant	Very relevant
Level of recycled material in the product	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Level of the product that can be disposed to landfill or incinerated	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Level of biodegradable content in the product	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Availability of eco-labeling	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Level of usage of design-for-assembly/dis-assembly in the product (fewer parts means less recycling)	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Level of market share controlled by the green product	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Environmental quality

	Not relevant	Minor relevance	Moderately relevant	Relevant	Very relevant
Percentage decrease in customer dissatisfaction	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Percentage decrease in product defect and functionality	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Percentage decrease in delivery unreliability	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

	Not relevant	Minor relevance	Moderately relevant	Relevant	Very relevant
Percentage decrease in scrub and rework	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Percentage decrease in environmental risks	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Availability of green product warranty	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Responsiveness to green requirements

	Not relevant	Minor relevance	Moderately relevant	Relevant	Very relevant
Percentage decrease in total supply chain cycle time	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Percentage decrease in order lead time	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Percentage decrease in product development cycle time	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Percentage decrease in manufacturing lead time	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Percentage increase on-time delivery	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Flexibility and the ability to adjust

	Not relevant	Minor relevance	Moderately relevant	Relevant	Ver relevant
Ability to adjust to increase in environmental demand	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Rate of delivery flexibility	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Level of adjustment in production flexibility	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Level increase in replenishment rate	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Environmental Regulations

What is the perception of your company in regards to the following statements?

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
Environmental regulations entail increase in costs	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Environmental regulations create market opportunities for the company	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
Environmental regulations positively modify market demand and assessment criteria	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Environmental regulations are not an option but a necessity	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Stronger environmental control will generate better results	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Does the company think that environmental regulations need to improve?

- (1) ☐ Yes, Why? _____
- (2) ☐ No, Why? _____

How do you describe your collaboration with environmental authorities?

- (1) ☐ Enemy
- (2) ☐ Partner
- (3) ☐ Co-operation
- (4) ☐ Control and enforcement

Environmental Incentives and initiatives

What is your firm's perception regarding environmental incentives and initiatives?

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
Environmental regulations are more effective if they are tagged to incentives	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Financial initiatives encourage environmental investment, improve competitiveness, and ease the cost pressure of environmental performance (e.g. Tax breaks, green loans, etc.)	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Suppliers incentives is a useful way to promote environmental performance among suppliers(e.g. rewarding environmentally performing suppliers with increased business and preferred status)	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Environmental support programs are helpful in promoting environmental practices (e.g.	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
Training and seminars; specialized advice in technology and design; knowledge based environmental programs; etc.)					
Environmental support initiatives are needed in order to promote environmental practices and performance (e.g. support advice through an Environment Helpline, On-line directory with useful contacts, publications; etc.)	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

To what extent is your company implementing environmental incentives, programs and initiatives?

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
We are implementing environmental programs with key suppliers	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Our company has an internal environmental award system	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
We provide preferential treatment to environmentally performing suppliers	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
We do not have any environmental incentives	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
We are not engaged with any environmental initiatives because they are costly and time consuming	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
We don't know how to implement environmental programs	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Do you have any particular incentives in mind? Please specify.

Benefits realized from implementing environmental management

Because of implementing an environmental management, specific benefits were achieved in the following areas:

	No benefit	Minor benefit	Moderate benefit	Good benefit	Substantial benefit
Increase efficiency	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Quality improvement	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Productivity improvement	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
New market opportunities	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Improvement in green market responsiveness	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Improvement in market shares	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Cost savings associated with improved use of resources	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Improvement in environmental compliance	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Reduction in insurance premium costs	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Increase in product/service prices	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>
Improved corporate image	(1) <input type="checkbox"/>	(2) <input type="checkbox"/>	(3) <input type="checkbox"/>	(4) <input type="checkbox"/>	(5) <input type="checkbox"/>

Do you have any additional comments?

Thank you for participating in this survey. Your answers are now saved.
Kind regards.

Appendix III – Control Variables

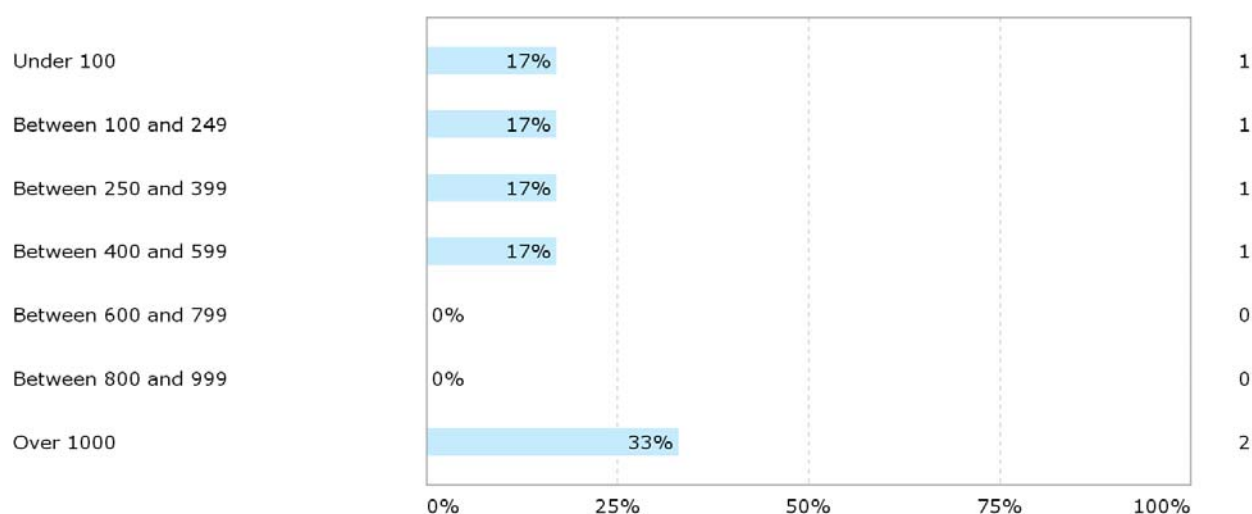


Figure 1: Size of the companies measured by the number of permanent staff in Norway¹

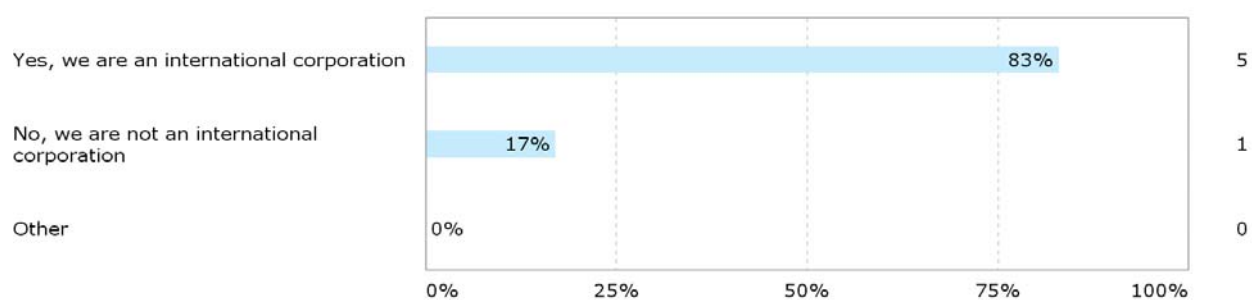


Figure 2: Companies internationalization

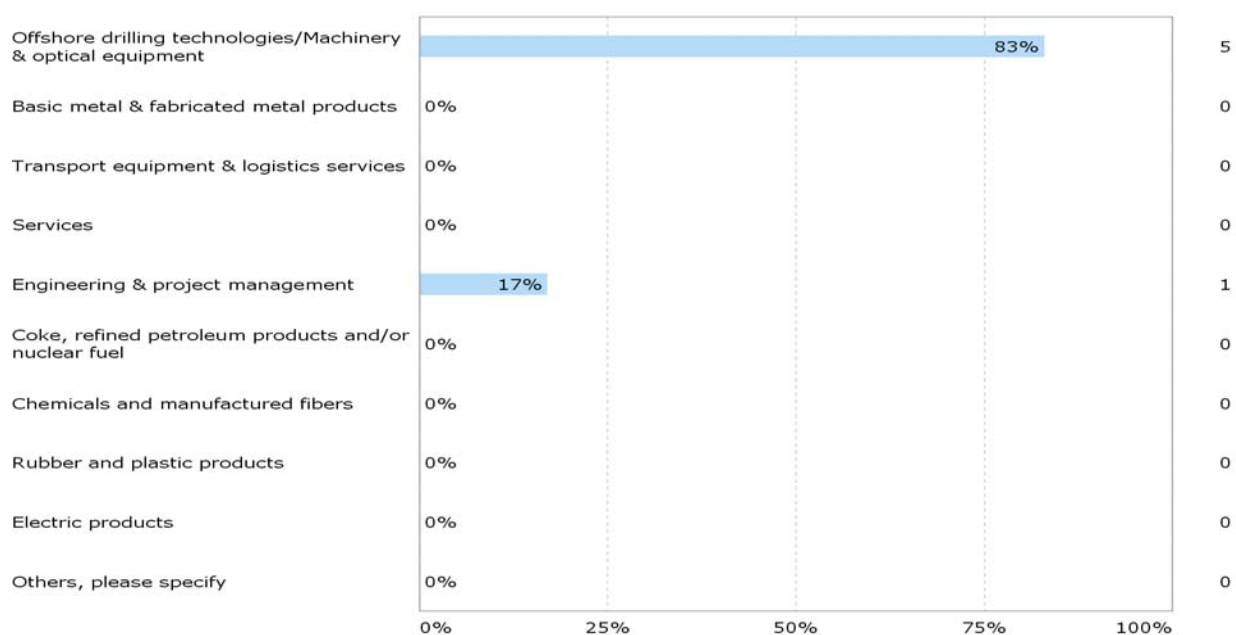


Figure 3: Industry focus

Appendix IV – Environmental Practices Analysis

Environmental performance practices	Company A	Company B	Company C	Company D	Company E	Company F	Cross-case Index score (100% scale)
Green purchasing practices	4	3	2	3	3	4	54.17
Environmental collaboration with suppliers	4	3	2	4	5	4	66.67
Environmental collaboration with customers	4	3	4	4	5	4	75.00
Use of environmentally friendly material	4	4	4	4	4	3	70.83
Use of clean technology	4	3	4	4	3	4	66.67
Recycle/re-use of material waste	3	4	4	5	5	4	79.17
Use of alternative sources of energy	3	3	2	2	4	5	54.17
Optimization of processes to reduce solid waste	4	3	2	4	4	4	62.50
Optimization of processes to reduce water usage	3	3	2	2	4	2	41.67
Optimization of processes to reduce noise	4	3	2	2	2	2	37.50
Recovery of product at end-life cycle	3	3	4	3	2	3	50.00
Eco labeling and packaging	2	3	3	2	4	3	45.83
Using more environmentally friendly transportation	3	3	2	2	4	5	54.17
Support new methods/ideas to improve environmental performance	3	4	2	3	4	4	58.33
Increase in environmental investments	4	4	2	4	4	4	66.67
Clearly articulate and publicize environmental information	4	3	2	3	3	2	41.67
Provide annual environmental disclosures	4	2	2	4	3	3	50.00
Individual Performance Measurement (IPM)_score	60	54	45	55	63	60	

Table 3: Individual performance scores & cross-case Index performance scores for environmental practices¹

- 17 composite measures of different practices used to measure environmental performance.
- Scale measurement: (1=strongly disagree to 5=strongly agree).
- Scale index is based on 100% and the mean value is (50.00)